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EDITORIALS

A FAIR CONTRACT.

The electrical contractor, like other species of the genus, is brought up on risks and is inclined to accept reasonable ones without demur; in fact, he may even greet risks with considerable pleasure if there is a prospect of corresponding opportunities for profit connected therewith. A certain amount of risk is inherently connected with the business of contracting, and no contractor with a taste for the work would think of shunning these. They introduce an element of uncertainty which adds zest to the work and appeals to the gambling instinct which does not seem to be entirely lacking in any member of the human family, and is sometimes abnormally developed in the electrical contractor. The uncertainties of the weather, the labor market, the delivery of materials, the work of other contractors upon whom he must depend, accidents, fires, and various other contingencies, add to the interest of his problem, and often offer opportunities for the exercise of judgment and ability which may be the deciding factors in the determination of ultimate profits or loss.

All of these factors which cannot be determined in advance represent chances which the contractor must face, and if he is wise he covers the possibilities, when making up his bid, by an allowance for contingencies. There are other elements in the work, however, which could be determined in advance, but upon which the contractor is frequently asked to bid in the dark. Such elements are represented by incomplete specifications or drawings; specifications whose terms are indefinite and subject to interpretation by architect, engineer or some one who has no interest in protecting the contractor; and terms in the contract which place responsibilities upon the contractor over which he has no control and which he should not be expected to meet.

One meets with contracts of this kind not only in the hands of incompetent or unscrupulous architects, but also in government work. It is not unusual in the latter case to find specifications incomplete, but a requirement that all work shall meet the approval of an inspector. In other cases specifications are unnecessarily rigid and inspectors have no authority or interest to permit the slightest departure from the literal wording of the specifications.

To be perfectly fair, contract should include specifications completely covering the work, while any elements which cannot be completely predetermined, so far as the owner's requirements are involved, are left to settlement or to determination of cost as extras by an impartial referee.

THE BIG POWER LOAD IN WAR-TIME.

We have on several occasions referred to some of the adverse effects of war conditions upon British electricity supply systems as typical of what may be expected in war-time at the present day. War-time darkness has affected the public and private lighting demand, and difficulties due to fuel prices and transport troubles, as well as increased cost of all materials, have been very real factors, which in many cases have left a marked effect. But these things form one-half of the story. There is another side, which is demonstrated very strikingly in returns which have been issued concerning some of the largest undertakings operating in the great industrial centers of the United Kingdom. The details afford statistical confirmation of what has been generally noted, namely, the enormous use which has been made of electrical energy as an industrial force in the manufacture of war munitions practically everywhere.

Three examples may be cited. The Glasgow municipal electricity system in the past year advanced its sales from 104 million kilowatt-hours to 130 millions, and its revenue went up by $500,000 to $2,500,000, all of the plants running at heavy overload, especially during the winter months. The Birmingham municipal power and lighting system increased its sales from 83 to 117 millions of units and, leaving the tramway load out of account, there is recorded an advance of 52.8 per cent in power and light alone. But more remarkable than these is a phenomenal advance in what is by nature of the size of the town a much smaller system, of from 3.5 million units to 14 million units, at Barrow in Furness, in northeast England. Twelve million units out of the total were used for industrial power and the commercial and financial results are perhaps as interesting and forceful an example of the benefits of expansion as could be found anywhere. The power load realized 1.5 cents per kilowatt-hour. The total receipts advanced from $132,925 to $296,040, and the total costs from $69,335 to $174,045. The percentage of costs to receipts rose from 52.16 per cent to 58.79 per cent, but the gross profit percentage to capital expenditure increased from 8.55 to 14.80, the average price obtained per unit falling from 3.48 cents to 2.04 cents, as the working costs per unit dropped from 1.84 cents to 1.21 cents. While the maximum load advanced from 2,285 kilowatts to 3,905 kilowatts, the load-factor improved from 17.97 per cent to 40.36 per cent.

These facts strikingly emphasize the importance of the industrial element in modern warfare.

AGITATION FOR UNDERGROUND LINES.

A somewhat unique improvement organization has been formed at Philadelphia under the name of the "Wire Underground League," having for its immediate object the elimination of present overhead lines in important business and residential sections of the city. The league seeks to use its influence to free Philadelphia from a large portion of the existing overhead wires of every description that, according to insurance interests, serve as a constant menace in cases of fire by line obstructions, a condition that has frequently been brought to the attention of city officials by insurance companies.

It is interesting to note in connection with the formation of this improvement league that the Pennsylvania Public Service Commission is in position to assist materially the cause of underground installations in the city. The Commission is now considering an agreement for the lease of the present unused conduit system of the Keystone Telephone Company to the Philadelphia Electric Company at a rental price in excess of $100,000 per year until such minimum is reached in 1921. While it is reasonable to assume that the electric company is desirous of obtaining this conduit system for the underground installation of certain of its lines, the terms of the proposed contract do not stipulate any feature of this character, leaving any such feature optional with the company.

By adopting a suitable basis of action and co-operating with the electric companies in the fulfillment of its purpose, the Wire Underground League should be of material assistance in effecting the desired municipal improvement.

However, the new organization should, if it really has the interest of the city at heart, make a careful study of the many phases of the question and not clamor blindly for action that would impose serious burdens on the utility companies that by increasing fixed charges on the investment increase the cost of electric service. Pratically all electric public service companies appreciate the benefits of underground service and strive wherever possible to make installations of this character, but it must be realized that the cost of placing lines underground is high and in many cases would be prohibitive under prevailing rates. Intelligent assistance and co-operation, such as could be given by an organization like the Wire Underground League, will be welcomed by central-station companies and telephone and telegraph companies generally, if the activities of such organizations are in line with sound engineering judgment and within the realm of financial possibilities.

It must be borne in mind that the subject of placing wires underground is nearly thirty years old. The alarm raised because of the frightful hazards anticipated from overhead trolley, light, power and even telephone wires has been shown to be almost entirely unfounded. High-class construction together with first-class maintenance and as far as possible joint use of pole lines minimizes the objection to their appearance on the streets.

THE AMERICAN INSTITUTE CONVENTION.

The annual convention of the American Institute of Electrical Engineers, held last week at Cleveland, marks the close of an administration which has covered events of unusual importance. Within the year have occurred the International Engineering Congress at San Francisco and the call from President Wilson to nominate candidates for the Naval Advisory Board and later to participate in the inventory of engineering resources with reference to industrial preparedness for war. No fitter incumbent of the office of president of the Institute during these momentous times could be found than Dr. John J. Carty. Devoted to the work of the American Institute of Electrical Engineers, jealous of its prestige and of that of engineers in general, keen to further its interests, a man of ripe judgment and great engineering attainments, he has steered the course of the Institute with ability, winning the co-operation of the Board of Directors and the approval of the general membership. Coming directly after the achievement of telephoning across the continent by wire, and just before the achievement of telephoning across the continent without wires, in which achievements President Carty and his business associates have had such a prominent part, his selection of the highest office in the gift of electrical engineers was most fitting and timely, and has been followed by the bestowal of many honors from other sources, such as medals and honorary degrees.

The convention at Cleveland was one of the most successful yet held by the Institute. The entertainment features were excellently planned and executed for which great credit is due to the Convention Committee, and perfect weather conditions added to the general enjoyment of the program. The registration was the greatest since the Boston convention four years ago, and the participation of college professors unusually large. The technical sessions were well attended and the discussion did not flag. In spite of the comparatively few papers on the program, the available time was completely consumed, and the unwisdom of placing so many as six papers upon the program of a single session was demonstrated by the necessity of slighting the later ones, in spite of their interest and importance and the presence of members ready to discuss them.

INDUSTRIAL RESEARCH.

The convention brought the subject of research into prominence through President Carty's address on the relation of pure science to industrial research and Professor Karapetoff's paper on electrical research in colleges. The latter precipitated a very interesting discussion in which different points of view were brought forward. Research work in institutions of learning is inaugurated for two purposes; one is the discovery of facts and the other is the training of the student. In commercial and industrial laboratories the latter feature is entirely lacking, but it is nevertheless important to them in relation to training men who can do their work. The search for information and principles in the university laboratory, whether it

be the laboratory of engineering or of pure science, is intended for public benefit and this goal is best reached by giving the widest publicity to the results. This object can best be attained, whether a thesis is printed or not, by turning copies of it over to the abstracting journals.

The laboratory of a manufacturing concern is usually occupied in determining properties of materials or applications of energy and processes which constitute invention and can be applied in business for private gain. Secrecy secures this object better than publicity, and the latter is only sought through the issuance of a patent which will grant the same protection as secrecy in its use. The importance of research in promoting the work of manufacturing and other industrial concerns has long been recognized in some quarters but has been ignored in others. The great awakening which has taken place in England since the outbreak of war is being reflected in this country, and many corporations are perfecting plans to install research laboratories which have never before given the subject due consideration. The public interest in the subject is shown by the offer of the Engineering Foundation to undertake the federation of all the research agencies of the country with the object of co-ordinating and encouraging the application of scientific principles to industry and to national defense.

The feasibility of securing co-operation between college laboratories is much greater than between industrial laboratories. The latter are frequently working upon the same problems in competition, with success going to the one which first secures the desired results. On the other hand, college laboratories are interested in avoiding duplication of work and a clearing house which might co-ordinate their work could be of much benefit. To what extent the colleges and industrial corporations can co-operate is a question. No doubt industry receives the greatest benefits from educational institutions in the training of men and the discoveries in pure science. Applications of science to industry can usually be worked out to better advantage in the industrial laboratory, where the needs are better understood and the facilities more frequently available.

When the importance and the advantage to an industry of industrial research laboratories are more widely realized their number will be greatly multiplied. The electrical industry has not been backward in this respect, and its youth has made this course a natural development. The benefits of research laboratories and staffs to the electrical corporations which have maintained them are generally appreciated, but by no one more than by the officials of the corporations concerned. Their testimony may well be heeded by others. The encouragement of research in pure science in our university laboratories and research in applying science in commercial and industrial laboratories to the needs of industry is a vital element in our future national progress.

THE MEASUREMENT OF VOLTAGE.

A low voltage may be measured by direct comparison with a standard or by measurement of the current which it produces. Voltage of higher value may also be measured by means of the physical force of repulsion exerted by the charge due to such voltage. When we come to the highest voltages, it has been usual to achieve measurements through the breakdown of an insulating medium. The most available medium is air, and its properties are sufficiently definite to answer this purpose.

The earlier method was to permit a discharge between needle points, the voltage necessary for breakdown being fixed by the distance between the points. The high voltages met with industrially are usually alternating in character, and this method measures the maximum value. The effective value will then be ascertainable only in case the form-factor is known. The needle gap has many disadvantages, especially for very high voltages, and the sphere gap has supplanted it for voltages exceeding 50 kilovolts.

In the last few years another method of measuring high voltages has been developed and was brought forward at the Institute convention in the form of an instrument designated as the corona voltmeter. This also makes use of the electric breakdown of the insulating air, but under conditions such that corona instead of a spark occurs. This condition is secured by using as the active electrode a straight wire mounted axially in a concentric cylinder whose diameter is many times that of the wire. The coronal discharge is determined by the density of the air and the diameter of the wire, and may be observed visually or by means of an electroscope, a telephone receiver or a galvanometer. As used by Messrs. Whitehead and Pullen, the voltage of discharge may be altered by making the outer cylinder air-tight, connecting it to an air pump, and varying the the density of the air.

Several precautions must be observed in using this instrument. Observations must be taken at the first appearance of corona, since temperature and pressure of the air, which are used to determine the density, may be altered by a continued discharge. For the same reason the volume of the containing cylinder should be ample. The wire used must be straight and clean and of uniform section. With proper conditions and careful work a high degree of accuracy and reproduceability of results may be anticipated and the instrument may prove to be very useful within its range. This range is of course limited and for a working instrument there is the added disadvantage that adjustment must be made for the voltage to be measured.

Another form of corona voltmeter, proposed by others, obviates this difficulty. The discharge voltage depends not only upon the density of the air but also upon the diameter of the wire. By altering this the setting of the instrument is changed. It is not feasible to have a multitude of wires available, but a single wire may be made conical in shape, and the point along its length which limits the zone of corona is a measure of the voltage.

Happenings in the Industry

Report of the Closing Sessions of the Annual Meeting of American Institute of Electrical Engineers at Cleveland—Electrical Exports for April Show Gain Over Year Ago—Convention Program of the Ohio Electric Light Association—Developments in Reflectors Discussed by Chicago Section, Illuminating Engineering Society

ANNUAL CONVENTION OF ELECTRICAL ENGINEERS.

Report of the Closing Sessions at Cleveland.

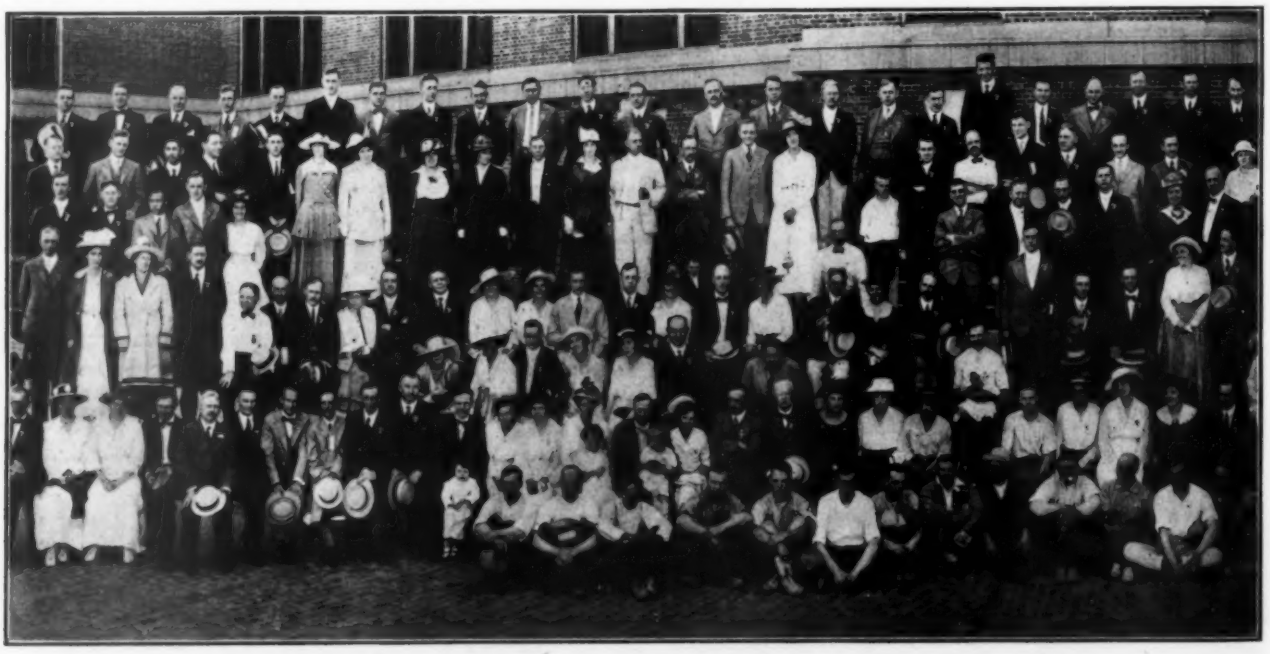
The discussion of high-voltage subjects occupied the session of the annual convention of the American Institute of Electrical Engineers, which was held on Thursday morning, June 29. This was known as the Electrophysics Session. The first paper at the session was by F. W. Peek, Jr., and was entitled "Effect of High Continuous Voltage on Air, Oil and Solid Insulation."

The dielectric strength of air, oil and solid insulations was determined for direct voltages up to 150 kilovolts. The direct visual corona voltage is equal to the maximum alternating corona voltage for wires varying in radius from 0.013 centimeter to the largest sizes. The laws for alternating voltages apply equally well for direct voltages in terms of maximum values. When corona precedes spark-over there is generally a difference in alternating and direct spark-over voltages. For a non-symmetrical gap, spark-over at normal air density takes place at the lowest voltage when the electrode surrounded by the denser field is positive. At low air densities spark-over takes place when the electrode surrounded by the denser field is negative. Insulators spark-over at the lowest voltage when the cap, or electrode surrounded by the denser field, is positive. The positive spark-plug voltage generally corresponds closely to the maximum alternating spark-over voltage. The direct spark-over voltages in oil generally correspond closely to the maximum alternating spark-over voltages. In wet oil the direct spark-over voltage is lower than the alternating. The direct breakdown voltages of solid insulations, in good condition, are generally higher than the maximum alternating voltages. This is especially so when the time of application is long and the insulation is thick. The direct breakdown voltage on varnished cambric apparently increases directly with the thickness, while the alternating breakdown voltage increases at a lesser rate.

This paper was discussed by John B. Whitehead, William Baum, S. P. Farwell, C. E. Skinner, Chester L. Dawes, Clayton W. Sharp, John B. Taylor and L. T. Robinson. Dr. Whitehead told of performing similar experiments with air and finding different results according to whether corona was on the positive or negative electrode. The positive electrode gave values agreeing with those obtained with alternating voltage. Mr. Baum referred to conclusions reached years ago by Thury, who found that cables would stand direct voltages of much higher value than alternating voltages, which favored the use of the Thury direct-current system of transmission. Mr. Skinner told of experiments to determine conditions for breakdown of solid insulations before the necessary voltage was actually reached. He thought there was a possibility of predicting breakdown from a determination of power-factor and energy losses in the insulation. Mr. Robinson pointed out the advantage of direct voltage in cable testing, since the charging current was eliminated and testing machines of much smaller capacity could be used.

John B. Whitehead then presented a paper by M. W. Pullen and himself entitled "The Corona Voltmeter." This paper described an instrument which measures voltage by the detection of corona. Three methods for detecting the first appearance of corona, in addition to the method of visual observation, have been developed. These involve the use of the electroscope, galvanometer and telephone respectively. A wire is mounted axially in a concentric cylinder which is airtight. The voltage which will produce corona depends on the diameter of the wire and upon the density of the air. An air pump connected with the cylinder enables the density to be controlled, thus permitting the instrument to discharge at different voltages.

This paper was discussed by L. W. Chubb, Clayton W. Sharp, J. R. Craighead, C. F. Harding, F. W. Peek, Jr., Jacob Kunz, L. T. Robinson, J. B. Taylor and M. G. Lloyd. Most of the



Group at Convention of American Institute of Electrical Engineers at Cleveland—Left Half.

speakers praised the instrument as a standard instrument for the measurement of high voltages, but did not consider it would be so useful as a working instrument as some other forms, since it is not direct reading, and the air density must be adjusted to correspond to the voltage to be measured. Professor Harding suggested that the Institute inaugurate an investigation to determine a standard method of measuring high voltage. Professor Kunz referred to the change of pressure within the instrument due to the ionization produced by corona, which is sufficient to serve as a measure of voltage. The discharge is different according as the wire is positive or negative and it is also different for high and low frequency. The characteristics of the discharge in other gases such as hydrogen are entirely different from air. In fact a hydrogen tube can be used as a rectifier.

In closing the discussion Dr. Whitehead said there was no noticeable change in the pressure when corona took place in his instrument and since the reading is obtained immediately the discharge begins, there is no error due to heating. He also gave the results of a comparison of the instrument with a sphere gap which showed close agreement.

E. E. F. Creighton then presented a paper entitled "Theory of Parallel Grounded Wires and Production of High Frequencies in Transmission Lines."

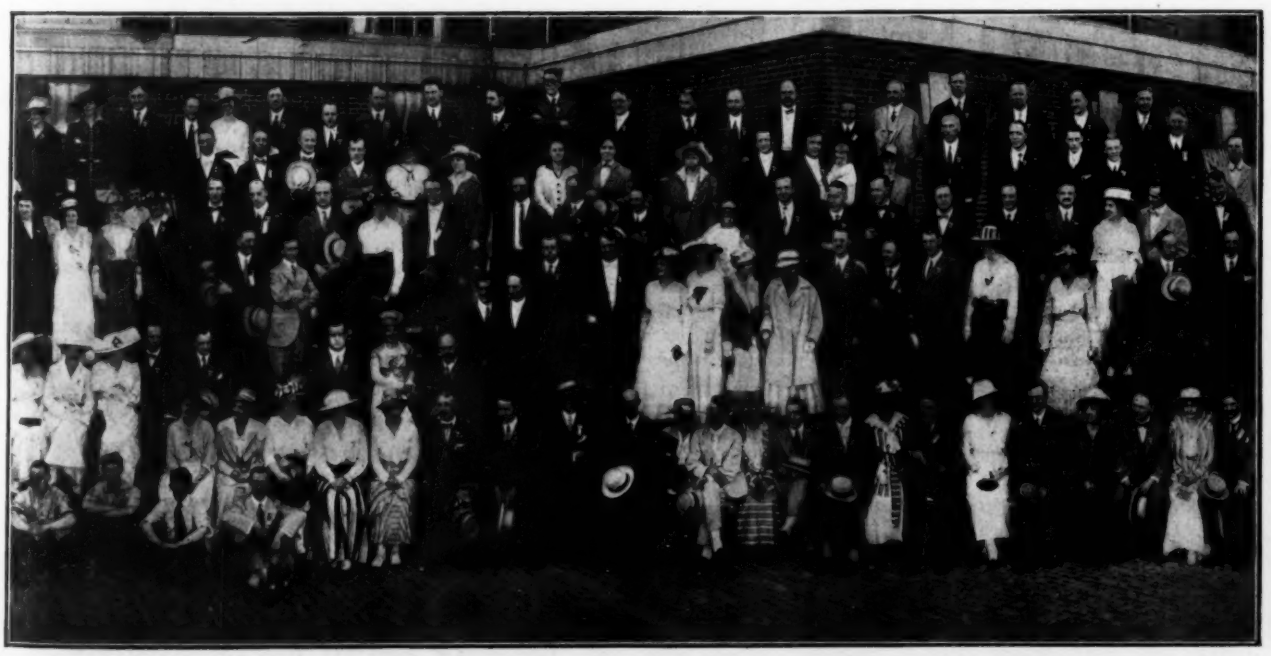
The overhead grounded wire is used for three purposes: lightning protection, mechanical support for towers, and a test circuit. The functions of the grounded wire are subdivided into four categories: first, the vertical grounded wire; second, the lightning rod extending above the ground; third, the electrostatic induction in the horizontally situated wires; fourth, electromagnetic induction. The vertical wire prevents splitting of the poles. The lightning rod is of mooted desirability. The electrostatic induction for a given cloud on wires under various conditions is worked out. There is given also the protective values of overhead grounded wires in different positions and in different numbers. The effects of electromagnetic inductions have been taken into account. Theory is given to show that the grounded wire introduces into the main wave of induced lightning surge a superposed high frequency by electromagnetic induction. The general deductions for practical use taken from the theory given are as follows. From a theoretical standpoint a single grounded wire should be placed as near as practicable to the power wire in order to get the greatest electrostatic protection. The grounded wires are more effective when placed above a power wire than when placed below it. In installing overhead grounded wires the greatest advantage can be obtained by keeping the overhead grounded wires as far apart as possible, that is to say, installed, as far as practicable on opposite sides of the power wires. Also from the electromagnetic standpoint, the two wires should be placed on opposite sides of a power wire in order to reduce to a minimum the transfer of surge energy to the power wire. The most practicable condition of protection by four grounded wires is to use the four wires in a rectangular formation which gives the widest separation. Naturally two will be above the power wires and the other two will be either below or at each side about on a level with the two lowest power wires. The mechanical conditions of installation will dictate where these wires will be hung.

This paper was discussed by H. S. Osborne, John B. Taylor, John B. Whitehead and L. W. Chubb. Mr. Osborne pointed out that the ground is not a perfect conductor and the effect of its resistance is considerable. A row of trees near a line may have an important electrostatic effect. One desirable effect of an overhead ground wire is to protect parallel wires from the inductive action of power circuits. Others emphasized that the discharge from a cloud is not instantaneous, but gradual in comparison with the oscillations on the wire.

The convention was held in Cleveland from June 27 to 30. The sessions of Tuesday and Wednesday were fully reported in the last issue. On Wednesday evening there was a meeting of the Board of Directors and separate meetings of the Section delegates and the representatives of Institute branches.

On Friday an all-day excursion on the steamer *City of Erie* was taken to Put-in-Bay. A session was held in the morning on board the boat. A paper by V. Karapetoff entitled "Suggestions for Electrical Research in Engineering Colleges" was, in his absence, presented by A. W. Gray.

The object of the paper was to present a list of topics in electrical engineering suitable for thesis, research, and advanced study. A plea was made for systematic research, each college specializing year after year in only a few topics for advanced investigation. The author suggested that the Educational Committee of the Institute become a central place for information and a stimulus in applied electrical research, cooperating with engineering colleges and with individual inventors and investigators. Various types of investigations were enumerated, such as invention, experimental study, theoretical study, library search, and compilation of data. Some advice



Group of American Institute Convention Photographed at Nela Park—Right Half.

was given the young investigator as to how to proceed in the most efficient way.

The paper was discussed by J. B. Whitehead, A. E. Flowers, C. E. Skinner, F. C. Caldwell, E. E. F. Creighton, D. D. Ewing, C. Francis Harding, J. J. Carty and D. H. Braymer. Several of the speakers favored a Research Committee of the Institute, and co-operation between the engineering colleges. College research work is for the purpose of developing the men as well as for results. Messrs. Skinner and Carty presented the attitude of the business corporation toward research. The results must be protected for private gain and publication is not desirable as in the case of pure science. When the manufacturers are properly aroused to the need of industrial research, it will tax the abilities of the universities to turn out men who can do the work.

Mr. Creighton emphasized the importance of attitude and of training in achieving invention. He praised the Montessori method of education as cultivating the originality necessary in invention. Professor Ewing called attention to the kinds of research which do not lead to invention, such as studies of operating factors and economic relations.

N. S. Diamant then presented a paper entitled "Application of a Polar Form of Complex Quantities to the Calculation of Alternating-Current Phenomena." The paper described a simple method of dealing with vectors by use of an operator j^n where n may have fractional values. This operator obeys the rules of ordinary algebra and represents the phase relation of the vector. Illustrative problems were worked out. The paper was discussed by A. W. Gray, E. E. F. Creighton, J. B. Whitehead and E. H. Colpitts.

A paper entitled "Tractive Resistances to a Motor Delivery Wagon on Different Roads and at Different Speeds," by A. E. Kennelly and O. R. Schurig, was, in the absence of the authors, read by title.

Entertainment.

The entertainment features of the convention were especially well planned and carried out, and perfect weather contributed to their success. On Tuesday there was a luncheon for the ladies which was attended by 78, and it was followed by visits to several department stores. In the evening there was a reception, dinner and dance at the Hollenden Hotel, at which 240 covers were laid. Wednesday afternoon was devoted to an automobile trip and in the evening the ladies were given a theater party.

On Thursday afternoon special cars took the members and guests to Nela Park, where the afternoon was given over to sports and games. Finals in the tennis and golf tournaments were played and a full nine-inning game of baseball was played, Captain W. A. Hall's team defeating the nine of Captain Farley Osgood by the score of 12 to 11. The umpires were L. T. Robinson and N. A. Carle. Other winners of prizes are given below. The accompanying photograph was taken at Nela Park. On the left will be seen Honorary Secretary Ralph W. Pope sitting beside C. D. LeMaistre, secretary of the British Engineering Standards Committee, while behind them is Past-president Charles P. Steinmetz. Supper was served to 375 people in the commodious dining room, after which Farley Osgood presented the past-president's badge to President J. J. Carty. The evening was given over to dancing at the Shaker Heights Country Club, after which special cars were boarded for the return to the city.

During the boat trip on Friday the ladies had a card party, while dancing was provided on the main deck. A dainty lunch was served. In the afternoon prizes were awarded by the chairman of the Convention Committee, E. H. Martindale, as follows: Winning baseball team, box of cigars, Captain Walter A. Hall; longest hit, bat, R. F. Strickland; most hits, league ball, C. T. Mossman; most runs, flashlight, L. P. Crecelius; most errors, marbles, J. H. Payne; best man rooter, incense burners, Lewis T. Robinson; best lady rooter, incense burner, Mrs. J. Franklin Stevens; ladies' baseball throwing contest, first, fruit basket, Miss M. Spencer; second, jelly knife, Mrs. C. R. Underhill; blowing contest, ladies, six flower dishes, Mrs. E. H. Martindale, Miss Rowell, Mrs. Underhill, Mrs. Glick, Mrs. Bozell, Mrs. Scott; blowing contest, men, six ice-cream cones, C. R. Underhill, H. V. Bozell, C. B. Hoffman, N. G. Lindstrom, W. T. Snyder, C. S. Ripley; golf, ladies driving, first, set of two sterling candlesticks, Miss Merriman; second, electric curling iron, Mrs. N. A. Carle; golf, approaching and putting, men, first, gold watch guard, A. M. Schoen; second, belt, M. O. Troy; golf, putting, ladies, first, set of silver coasters, Mrs. N. A. Carle; second, universal electric traveler's iron, Mrs. Bedell; ladies' one-yard race, first, mahogany flower dish, Mrs. F. M. Hibben; second, silver tea-ball set, Mrs. Bozell; ladies' card games, bridge, first, clock, Miss Brewster; second, silver mesh bag, Mrs. Sohl; third, vanity case, Mrs. Kirby; ladies' card games, five hundred, first, silver mesh bag, Mrs. Bale; second, vanity case, Mrs. Spindle; golf contest, leg on Mershon trophy, L. F. Deming; first, match play, silver cup, L. F. Deming; second, match play, golf ball clock, J. R. Hewett; lowest score without handicap, bronze cup, L. F. Deming; tennis tournament, singles, first, silver-finished bronze cup, Mr. Plass; second, silver-finished bronze cup, Mr. Berry; tennis tournament, doubles, two silver cups, Messrs. Warren and Berry.

The total registration at the convention was 610.

Electrical Exports for April.

The electrical exports from this country for last April as reported in the monthly summary of the foreign commerce of the United States, just issued by the Bureau of Foreign and Domestic Commerce, Washington, D. C., were valued about 28 per cent more than in April of last year, although somewhat less than the high values of last February and March. The volume or quantity of the export trade has probably not materially increased over last year, the increase in total value being due almost entirely to the high prevailing prices. Quantities are given in the official reports for only four classes of electrical shipments, which in April compared as follows:

Articles	Numbers Exported in April, 1916	April, 1915
Electric fans	3,419	4,523
Arc lamps	22	35
Carbon-filament lamps	45,818	248,338
Metal-filament lamps	740,657	196,725

The following table gives the detailed figures for last April and for the corresponding month of a year ago:

Articles	April, 1916	April, 1915
Batteries	$ 168,142	$ 88,372
Dynamos or generators	151,727	127,071
Fans	45,528	61,926
Insulated wire and cable	386,239	354,344
Interior wiring supplies, etc. (including fixtures)	44,805	67,605
Lamps—		
Arc	639	554
Carbon-filament	5,410	27,665
Metal-filament	128,734	36,936
Meters and other measuring instruments	52,255	69,935
Motors	272,261	193,802
Telegraph instruments (including wireless apparatus)	7,965	14,377
Telephones	52,064	89,730
Transformers	68,889	47,763
All other	1,245,511	875,395
Total	$2,630,169	$2,055,375

For the first ten months of the last three fiscal years, ended on April 30 in each case, the electrical export totals were as follows:

Ten Months of Fiscal Year	Electrical Exports
1913-1914	$21,569,687
1914-1915	15,922,467
1915-1916	23,666,267

These totals do not include electric locomotives, which for these three ten-month periods totaled as follows: 1913-1914, $272,387; 1914-1915, $249,096; 1915-1916, $422,340. During last April five such locomotives, valued at $26,964, were exported.

Convention Program of the Ohio Electric Light Association.

The twenty-second annual convention of the Ohio Electric Light Association will be held at Cedar Point, O., July 18-21, with headquarters at the Breakers Hotel.

The first session will be held at 2 p. m., Tuesday, July 18. Following the president's address, reports of officers will be made. The illumination committee will open a discussion on street lighting contracts. Following this there will be a round-table session on executive and public policy subjects, at which the following papers will be presented: "Legislation Needed by Company and Consumer," by J. C. Martin, Columbus; "Taxation of Public Utilities," by Elam Fisher, Eaton; "System Among Employees as an Adjunct to the Public Policy of the Company," by W. A. Wolls, Columbus, and "Municipal Ownership, Its Shades and Shadows," by D. L. Gaskill, Greenville.

The second session, which will be of a technical nature, will be held Wednesday morning, and reports of the station operating committee and the transmission and distribution committee will be presented.

At the third session, to be held Wednesday afternoon, W. W. Freeman, president of the Union Gas & Electric Company, Cincinnati, will give an address on "The Public Policy of a Utility," and E. B. Fenton, manager of the department of publicity, W. S. Barstow & Company, New York City, will present a paper entitled "The Missing Link."

The fourth session, which will be held Thursday morning, will be given over to commercial problems. The report of the new business co-operation committee will be made and the discussion will be opened by H. C. Gillie, Cleveland; F. B. Steele, Dayton; W. A. Wadsworth, Cincinnati; L. Beecher, Hillsboro, and C. E. Yacoll, Youngstown. At the round-table session on commercial topics the following papers will be presented: "From Barter to Business Through Standardization," by S. E. Doane, Cleveland; "Deposits from Customers," by T. F. Kelly, Dayton; "Financing the Wiring and Fixture Installations for Contractors by the Banks as a Step in Development of an Old-House-Wiring Plan That Has Wired More Than 20,000 Old Houses," by M. E. Turner, Cleveland; "Merchandising from a Central Station Standpoint," by A. K. Young, Toledo; "Giving Free Electric Units in Exchange for Gas Arcs," by W. A. Wadsworth, Cincinnati; "Electric Heating," by H. O. Loebell, New York City, and "New Business Development During the Years 1915 and 1916," by W. A. Wolls, Columbus.

Henry L. Doherty, of New York City, will give an address at the fifth session, to be held Thursday afternoon, following which R. H. Grant, general manager of the Domestic Engineering Company, Dayton, O., will present "A Selling Talk."

At the last session to be held Friday morning new officers will be elected and the reports of the meter committee and the voltage standardization committee will be made. M. J. Wolf, of St. Louis, will give an address on "Jovianism and Its Relation to the Electrical Industry."

D. L. Gaskill, of Greenville, O., is secretary of the association.

Developments in Reflectors.

On the evening of June 29 a meeting of the Chicago Section of the Illuminating Engineering Society was held in the Edison Building, Chicago. The general subject of the evening was a presentation of new developments in reflectors and shades, in which the representatives of five manufacturers took part. A. O. Dicker spoke of new types of Brascolite fixtures, particularly one having a quite dense diffusing shade beneath the fixture for which there is an increasing demand in residences. Another fixture shown was one of somewhat elaborate design particularly adapted for use in churches. Each of these fixtures was shown with a natural amber-tint lamp. Mr. Dicker stated that the use of filtered flux, particularly of the amber tint, would probably find an increasing sale in the future.

J. W. Foster described recent developments by the Ivanhoe-Regent Works of General Electric Company. He gave special mention to the new pressed Sudan glass, which is a dense opal glass intended both for semi-indirect lighting reflectors and for those used in direct lighting. In the former case about 12 per cent of the total light passes directly through the glass. Mr. Foster stated that in his opinion reflectors made of the light-density opals should not be used with gas-filled lamps because they do not sufficiently diffuse the light thereof. He admitted that dense-glass reflectors are not easy to sell, because most purchasers still wish to see a bright light from the lamp itself. Other types of reflectors described were the new Holophane diffusing reflectors, special Holophane show-window reflectors and several new enameled-steel reflectors for use with 75-watt type C Mazda lamps.

J. Stair gave a demonstration of a number of new types of silvered-glass reflectors made by the National X-Ray Reflector Company. Among these were included reflectors for pure indirect lighting, luminous-bowl indirect lighting, and direct lighting, special reflectors for show-window, show-case and wall-case lighting, and reflectors for indirect lighting from special wall boxes or coves.

A. L. Arenberg described and showed a number of new features of the Maxolite enameled-steel reflectors which are marketed by the Central Electric Company. These are now made in an increasing number of types, including the flat, shallow-bowl and deep-bowl forms. The latter cut off the direct light at an angle of about 25 degrees. A recently developed form of flexible suspension for steel fixtures used in offices, shops, etc., was shown. In place of a canopy this fixture support consists of an outlet-box cover from which the stem of the fixture is directly suspended by means of an ingenious universal joint, thus permitting the fixture to hang plumb regardless of whether the outlet box is perfectly horizontal or not.

Otis L. Johnson showed and described new developments in reflectors made by the Benjamin Electric Manufacturing Company. Among these was a newly designed angle reflector of elliptical shape which has the double advantage of directing the brightest light downward at an angle of about 45 degrees and laterally at a similar angle; this makes a very much better distribution of the light when the reflector is used for lighting bulletin boards or signs or other purposes. A new form of deep-bowl reflector with fluted sides was shown, which was said to have an increased efficiency of about 13 per cent, because the light is reflected so that it does not pass through the lamp bulb a second time.

Water Powers of Maine.

The first annual report of the Public Utilities Commission of Maine, Volume 2, contains a large amount of valuable data pertaining to the topography, geology and water resources of the state, compiled by the Commission's engineering staff, and the United States Geological Survey.

Commenting on the great resources in water powers which would be even more valuable were transportation facilities more adequate, the Commission asks why an electrified line, with many branches, should not be operated the length of the state for the sole purpose of giving cheap transportation. Energy sufficient for the purpose is at command, and in sufficient quantity for vastly increased manufacturing, in addition.

Cheap power and lighting for farms are also within reach, and would result in vastly increased comfort, as well as material prosperity, the report points out.

Use of Electricity in Iron Foundries

A Discussion of the Advantages of Central-Station Service With Data on the Motor Installation in Two Typical Establishments Purchasing Power

Industrial Power Series—Article No. 170

IRON foundries, stove works and like industrial plants may seem at first thought to be unfruitful as an objective in securing central-station business. Such plants, however, necessarily use a large amount of power, and for several reasons central-station electricity is especially advantageous in the operation of a modern foundry or iron-working plant. As a rule, the buildings comprising such a works are scattered over a considerable area. They generally consist of only one story. The machinery which is power-operated is, as a rule, installed in isolated groups or singly, here and there throughout the plant. This makes for a particularly advantageous use of electricity over steam drive, in that motors can be installed anywhere they may be required, whether at the floor level, below it, or aloft, out of the reach of dust, steam and smoke.

Economy of Electric Drive.

The economies of electric drive, especially from central-station service, are obvious. Most foundries are run with greatly varying volume of output. Hence the cost of electric power is much less than the expense of maintaining a steam plant with a capacity for the maximum load required at any one time.

One small foundry formerly operated with a steam plant recently changed over to motor drive. The total motor installation aggregates 28 horsepower, the average load being about 7 horsepower. About 1,400 kilowatt-hours are used monthly, the bill for electricity averaging something under $50. With steam, the yearly expense was over $1,100, or $91 per month, though only two hours a day for the engineer were charged against the operation of the steam plant, his time being divided between this and other duties. The change to electric drive made a saving of almost 50 per cent in operating costs for power.

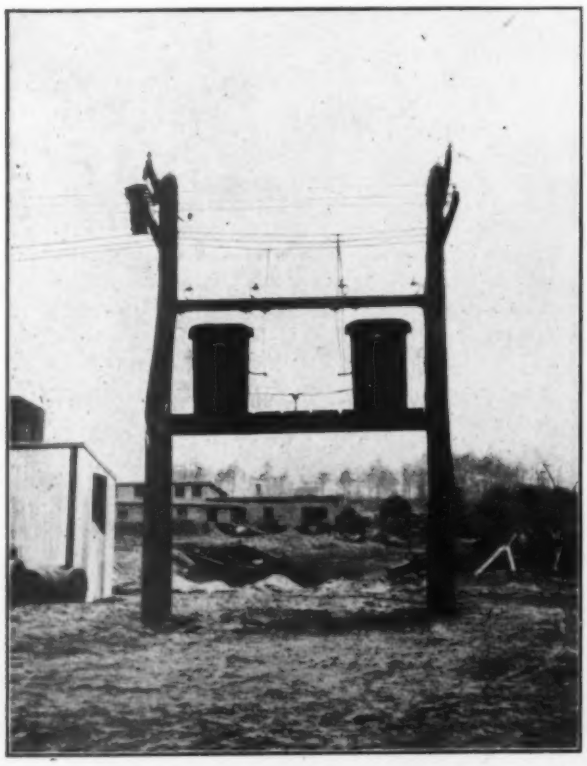
Installation at Magee Foundry.

The Magee Furnace Company, Inc., a large manufacturer of furnaces, stoves and ranges, has recently built an entirely new plant at Taunton, Mass., moving there from the former location at Chelsea, Mass. The plant consists of five large brick buildings for foundry and machine work, and a three-story wooden building used for offices, pattern shops, finishing rooms and shipping room. The product is shipped by the Electric Express, operated by the Bay State Street Railway Company; no side-track from any steam railroad reaches the plant, but arrangements are being made by which the trolley company will haul freight cars from the railroad direct to the unloading and loading doors of the furnace company, thus saving reloading.

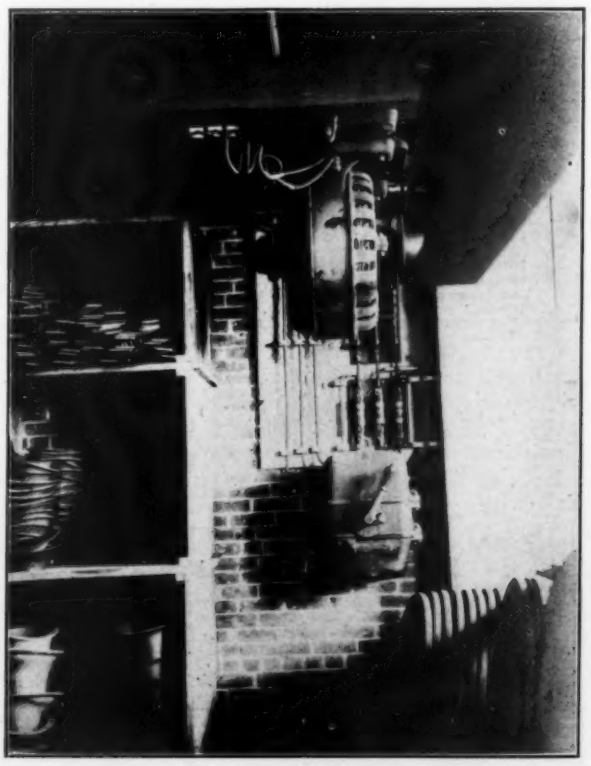
The installation consists of five motors, all of the induction type and operating on three-phase, 60-cycle alternating current. The total horsepower is 245.

Energy is brought to the works from the generating station of the Taunton municipal electric plant over a 2,200-volt line. Two 50-kilovolt-ampere 2,200/240-volt transformers are mounted on a pole structure near the machine shop. These being of small capacity for the large connected load, it is planned soon to install another 50-kilowatt transformer, which will amply care for the present connected load.

Most of the motors are belt connected to line shafts, operating groups of machines of one kind or of various kinds.

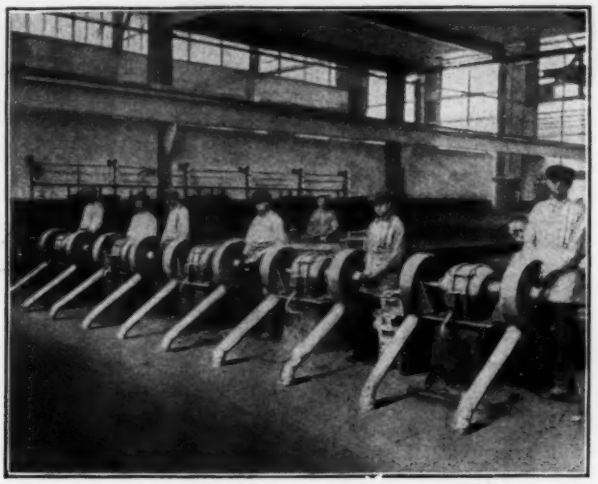


Transformer Installation Serving Magee Foundry.



Motor Operating Machines in Finishing Shop.

Motor in Magee Foundry Driving Group of Machines.



Battery of Motor-Driven Casting Grinders, Magee Foundry.

Practically all the machinery used in this, as in all foundries, is operated intermittently, or else its load varies from time to time. Hence the grouping of machines gives a better load-factor than single motorization and serves to balance the load on the individual motors. One of the principal types of foundry machines is the tumbling machine, a drum cylinder revolving fairly rapidly, and causing the rough castings placed in it to rub against one another and by attrition remove the sand, rust and roughness produced in the casting process.

In connection with each of these machines is an air draft tube connected with an exhaust fan, by means of which this dust and dirt is carried off and discharged out of doors. The operation of a single tumbler would produce a severely uneven load on a motor operating it singly, but by grouping several tumbling machines a fairly even balance of resistance is maintained.

After the castings have been taken from the tumblers they are finished on grinding machines. These likewise are grouped, and several grinders are driven through line shaft by one motor.

Not only are blowers used to remove foundry dust, but they are also employed to drive out fumes and smoke from the casting rooms, and forced draft is supplied to the furnaces in which the iron is melted. About 400 cubic feet of free air per minute is required for each ton of iron melted per hour. Centrifugal compressors are best adapted to this service, on account of the extreme steadiness of the blast, the economy of floor space, cost of foundation, and maintenance expense. A pressure of about one pound is especially adapted to cupola furnaces in foundries. With direct-current drive adjustment of pressure is obtained by changing the speed of the compressor set by means of a motor field rheostat, but induction-motor-driven sets are arranged for constant speed and pressure, and give entire satisfaction on cupola service.

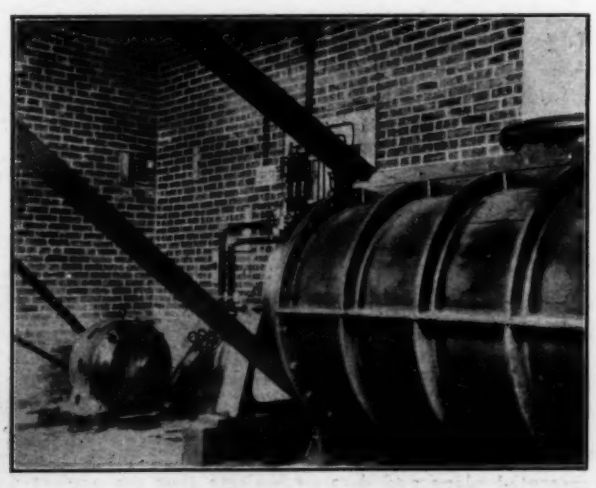
In fact, alternating current is regarded, on the whole, as being better adapted to foundry operation than direct current, especially where the power station is located at a distance, or central-station service is used. Former difficulties in applying alternating current to crane-motor service have been overcome and cranes operated by variable-speed wound motors are now used successfully for all lifting operations, placing of cores and withdrawing of patterns from the mold.

At the Magee plant a No. 6½ Roots blower is used to deliver forced draft to a cupola furnace. This, and an elevator used to deliver coke on barrows to the cupola of the furnace, are both operated by a 35-horsepower three-phase motor operating at 1,100 revolutions per minute. Motor and compressor are housed in a room behind the furnace, with brick partition wall between.

In the "ware room" are 15 tumbling machines, and a 70-inch Sturtevant blower to remove the dust to a dust arrester located outside the building. These machines and some minor apparatus are driven by a 100-horsepower 220-volt motor, mounted near the roof.

Other shops are operated by motors as noted in the accompanying table.

Group of Casting Tumblers Driven by Motor.



Motor Operating Blower for Furnace Draft.

Owing to the fact that the plant is not yet running to its full capacity and that the shafting and machinery is still rather stiff, it is impossible to give any correct idea of how much the power will cost the company. The Taunton plant's gross rates for power range from a maximum of 6 cents to a minimum of 1.75 cents a kilowatt-hour, as follows:

For the first 100 kilowatt-hours per month, 6 cents.
For the next 300 kilowatt-hours per month, 4 cents.
For the next 500 kilowatt-hours per month, 3 cents.
For the next 1,000 kilowatt-hours per month, 2.5 cents.
For the next 3,000 kilowatt-hours per month, 2 cents.
For all additional kilowatt-hours per month, 1.75 cents.
A 10-per-cent discount is allowed from prompt payment.

Motor Drive in Casting Plant.

Another similar installation may be noted in this connection as being of interest. A malleable-iron foundry producing about 25,000 tons of castings a year, mostly in small sizes, has 370 horsepower in motors installed.

Among the motors are five 10-horsepower direct-connected to No. 7 Buffalo blowers; a 30-horsepower, belted to a 6 foot by 6 foot slag mill; three 20-horsepower, belted through line shaft to saws, drill presses, lathes, shapers, nut tappers, planes and grindstones; three 50-horsepower motors, each belted to a battery of tumblers—one battery consisting of five 4 foot by 2 foot machines, one of eight 5 foot by 3 foot machines and the third eight 4 foot by 2 foot machines. Each group is equipped with a No. 8 Buffalo blower.

A 50-horsepower motor drives ten 26-inch emery wheels, ten 18-inch emery wheels and a No. 8 blower. Another 50-horsepower motor is belted to an 1,800 and 800-pound drop hammer and to three 10-inch emery wheels, through line shaft.

MOTOR INSTALLATION—MAGEE FURNACE COMPANY, TAUNTON, MASS.

All 220-volt, 3-phase, 60-cycle motors, energy supply from Taunton Municipal Plant.

No.	Horsepower	Machines Operated.
1	40	Drives 3 stamping presses, 3 emery wheels, punch, shears; and on floor above in pattern shop, 3 lathes, buzz planer, circular saw, band saw, 2 drills.
1	100	Drives 15 tumbling mills, 70-in. blower, 2 upright drills, 1 horizontal drill, 1 reaming and tapping machine, 1 radial drill, set emery wheels.
1	30	Drives sectional drill, large and small screw machine, small belt machine, 3 emery wheels, 3 lathes, planer, upright drill, bolt making machine, speed lathe, manifold drill.
1	20	Drives elevator between 3 floors, bandsaw, 3 circular saws, 2 fitters' lathes, 3 emery wheels, for making wooden flasks and frames; also 2 lathes and emery wheels in repair shop above.
1	20	Drives 7 emery wheels, 3 fitters' lathes, 1 "top" emery wheel, 1 small screw machine, 1 upright drill, 1 small stamping press, 2 bench emery wheels, 2 speed drills.
1	35	Drives No. 6½ Roots blower and cake elevator.

The average monthly consumption of this plant is about 40,000 kilowatt-hours; the maximum demand is 155 kilowatts, and the load-factor averages 33.5 per cent.

Large Hydroelectric Project in Vermont Approved.

The Public Service Commission of Vermont has granted a certificate of "general good" to incorporators of a company to be known as the Central Power Corporation of Vermont, which proposes to develop a hydroelectric plant at the Gorge of Middlebury River and distribute energy for power only in 12 cities and towns, and also for lighting in seven communities.

Hearings were held at Middlebury and the petitioners presented plans and data to indicate that the project was commercially feasible. Opposition was voiced by persons who claimed that scenic beauty of the region would be injured. Answering this claim, the Commission says: "While the Commission has a due appreciation of the scenic beauties of the State, we do not feel that such a consideration should be paramount in deciding a question concerning an industrial development of the State of Vermont through the medium of its water powers."

Owners of a hotel objected to the granting of a certificate, because of the possibility of the acquisition by the company of land devoted to public use by the terms of the former hotel proprietor, now deceased. The Commission says that the corporation would have no right to take any of the land except by condemnation proceedings in which statutory requirements must be shown, and even then could not take land already devoted to public uses.

The Montpelier & Barre Light & Power Company, already in the field and supplying energy throughout an extensive territory, opposed the petition, claiming that it was adequately supplying all the electricity demanded in Montpelier, Barre, Williamstown and other places, and that if the proposed new corporation entered the field "a competitive situation would be created which would be alike ruinous" to both companies, with no resulting good to the public. The Montpelier & Barre company also claimed that the proposed plan of development was impracticable and too expensive to result in profit.

The Commission says on these points: "We do not now pass favorably or unfavorably on the proposed plan of development. The evidence was extremely contradictory in that regard. If the proposed corporation be established, it cannot make any hydroelectric development without the Commission passing upon the capital securities of the corporation, which must be issued in order to finance any development. To secure our certificate of approval for the issue of stock and bonds, it will be necessary for the corporation to satisfy the Commission that the development is commercially feasible, will render a fair return on the money invested and will have a market for its output of electrical energy at rates which will be fair to both the consumer and the corporation and to the investor in its securities."

The Commission does not pass upon any particular plan of development of Middlebury River, but holds that some plan for the utilization of its waters for hydroelectric generation is feasible, at points where the petitioners have interests. The definite plans will be passed upon later.

Work on Milwaukee's New Street-Lighting System to be Pushed.

The City Council of Milwaukee, Wis., has established a Bureau of Illumination Service under the Department of Public Works. It will have immediate charge of the drawing up of specifications, letting of contracts, supervising the installation, and maintaining the new municipal street-lighting system that was described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of April 1 and 8, 1916. Francis A. Vaughn, who made a complete street-lighting survey for the city and who designed the new system, has been retained by the city as its consulting engineer at a salary of $10,000 a year. Work on the new system is to be prosecuted with dispatch, there being immediately available $750,000, the proceeds of a bond issue authorized at the election on April 4. The new Bureau will include a Division of Illuminating Engineering, that will look after engineering details and photometric testing, also a Division of Construction and Maintenance, which will have immediate charge of the construction work and upkeep. A photometric laboratory will be established by the city. There will be seven engineers and assistants in the Bureau, whose appointment devolves upon Commissioner of Public Works F. G. Simmons.

Flood Lighting of Bathing Beaches

Need of Effective Illumination of Beaches to Make Evening Bathing Safe and How It May Be Done by Flood Lamps as Shown by Two Typical Public Installations in Chicago

One of the most healthful and invigorating outdoor recreations in summer is bathing in a large body of water. Be it an old clay hole, a creek, river, lake or sea, the water has exceptional fascination on hot days for nearly everyone from the small boy to those advanced in years, and provides not only pleasant recuperation but splendid exercise. From a vacation sport swimming is gradually developing into an everyday summer recreation in those cities and places where facilities for bathing in a river, lake or sea are available.

Safety Requires Effective Lighting.

Safety is probably the most important requisite of a bathing beach. This means that the bathers must not only be free from treacherous under-currents, but should be protected by capable life guards ready at any moment to come to the assist-

Flood Lighting of Diversey Beach, Lincoln Park. Upper View Taken Looking South Shows Effective Lighting of Water. Lower View Looking North Shows Lighting of Sand Beach Approximating Daylight Effect.

ance of anyone in danger of drowning. These requirements suffice by day but when an effort is made to make bathing safe in the evening there arises the additional requirement of an effective illumination, not only of the beach proper but of the entire area of the water in which the bathers are permitted. Until such an illumination is provided the hazards of night bathing are too great to permit enjoying of this sport by any but the most experienced swimmers.

In our large cities only a very small percentage of men and women employed by day can utilize the bathing beaches on working days at any time but in the evening, and to accommodate this large element of the population various efforts at lighting of the beaches have been made. Heretofore the only way in which this has been done at a reasonable cost was by using a large number of lamps mounted on posts placed along the edge of the water. The effective range of such lamps could seldom be regarded as more than 200 feet out over the water. Where the beach is gently sloping, however, the necessity for effectively illuminating a much greater expanse of water is apparent and even in the case where the beach slopes rather sharply the desirability of exceptionally good illumination is urgent, because on such beaches particularly the danger of poor swimmers going beyond a safe depth is much greater. To illuminate a greater distance from shore by former methods was possible only by mounting posts in the water. This, while perfectly feasible, involves the considerable expense of properly anchoring such posts so they will not be upset by storms, and also the additional expense of supplying them through submarine cable.

Use of Flood Lamps for Beaches.

Since the advent of flood lighting by means of special projectors employing gas-filled tungsten lamps, a new method of lighting beaches has been made available. The success of the installations of this character already made indicates that this method of beach lighting will be employed on a very extensive scale. Already plans are being made for using it on a number of beaches and several installations will be completed before the summer is over.

Many advantages are possessed by flood lighting for beaches. Probably the most important is that it provides the most practical and economical way to light the beach effectively from the safety standpoint. Considering the large area of water that can be well lighted by means of a group of projector lamps, the expense involved is very small. The lamps may be mounted in one or two groups or batteries, and therefore the cost of installation and of maintenance is low compared with the use of a large number of lamps distributed along the edge of the water or mounted over the water itself. By the use of the gas-filled tungsten lamp the necessity for trimming and frequent attention to the lamps that formerly was involved in using arc lamps is entirely done away with. The entire battery of projectors when once installed and adjusted so as to distribute their light uniformly over the surface to be illuminated, can be left without subsequent attention, except that occasionally required for cleaning or possible renewal of a burned-out lamp. This makes such an installation very practical in comparison with the continual attention that would be required if modified searchlights were used with arc lamps.

Several types of flood-light projectors have been developed which have been found as suitable for beach lighting as they are for the lighting of a building exterior, monument, large sign, outdoor pageant or other purpose. In general, what is required is a projector which reflects the light over quite a large area, this obviously making it necessary to use a smaller number of projector units than would be the case where the area illuminated is restricted and sharply limited, as is the case where searchlights or spotlights, such as used in theaters, are employed.

To get the very best results in an installation of this character the projectors should be mounted at as great a height as possible, preferably over 50 feet. This permits not only the effective flood lighting of a larger expanse of the beach and water, but very materially reduces annoying glare when bathers look in the direction of the lamps. For this reason the erection of a tower may be desirable or, if any high building, bluff or other natural height is available, the lamps may usually be easily mounted thereon. Where no such convenient means of high support are available, or where the cost of building a special tower would be too high, the lamps should be mounted on top of the bath house or on a platform placed as high as practicable. Low mounting of the lamps, say less than 20 feet above the surface of the water, is not desirable because of the blinding effect when swimming or wading toward the brilliant light. With low mounting heights a larger percentage of the light is reflected from the surface of the water, which materially increases the glare.

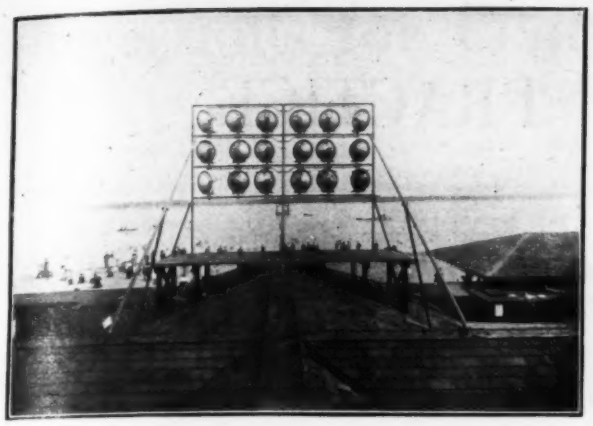
This effect, however, is more annoying at first than after the bather has been at the beach a short time, because the eye is instinctively turned away from the bright light just as it is by day from the brilliant light of the sun when the latter is near the horizon. Moreover, if the projectors are in one group, the light at any point on the beach or water comes from but one general direction, just as does the bright direct light of the sun which the eye is trained to avoid. Where a large number of lamps are placed along the shore, the glare is encountered in many directions and it is much more difficult to avoid it when returning to the shore.

Flood Lighting of Diversey Beach.

An interesting installation of flood lighting completed a few weeks ago is that at Diversey Beach in Lincoln Park, Chicago. This beach is open free to the public throughout the summer season. In order to increase the use of the beach in the evening it has been the custom heretofore to use a considerable number of lamps mounted on posts set close to the water's edge. These were fed from a special armored cable buried in the sand. As described in a previous article in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN these wooden posts were set out each spring just before the bathing season began and removed in the fall so as to avoid the danger of damage to them from the heavy storms of winter. The equipment in these posts consisted of tungsten lamps inclosed in opal balls. The lighting from this installation was as satisfactory as could be expected, but it was far from what is desirable. Even such as it was it showed very clearly the great popularity of night bathing. On warm summer evenings the beach was as crowded as it was by day.

Day View of Diversey Beach, Showing Mounting of Projectors on Top of Central Building.

As soon as flood lighting was developed to a practical point it was decided to utilize it at Diversey Beach and plans for this purpose were completed during the past winter. The installation was made during the last month and involved no difficulties. The simplicity of the installation can be readily seen from the two day views herewith. It consists of 18 General Electric flood-lighting projectors, each equipped with a 500-watt Type C Mazda or gas-filled tungsten lamp. These projectors are mounted on a frame-



Rear View of Diversey Beach Projectors.

work which was made of 1.25-inch galvanized-iron pipe and well painted after it was completed. Each projector has a swiveling base which, when once adjusted to the proper direction, is clamped securely. The vertical adjustment of the projector is made by means of a vertical clamping arrangement provided on the back of the projector itself. Current is brought up the middle pipe of the framework from which it is distributed in conduit to three pairs of laterals. Directly above each unit there is a Condulet terminal fitting from which the wires lead to the projector terminals. Only a very small amount of wire is exposed and this is weatherproof. The framework is well braced and surrounded by a small platform giving access to the front of the projectors for cleaning or lamp renewals, and to the back for adjustment of the angle of spread and general direction.

The installation in this case was made on top of the highest building included in the group of bath houses at the beach. The center of the group of lamps is nearly 25 feet above the ground. The extent of beach and water brilliantly illuminated is between six and seven acres. This includes all of the beach and water surface particularly devoted to bathing. The light from the lamps carries much farther, however, as it has been found that on the near side of Picnic Island, which lies about one-fourth miles east of and directly opposite the beach, sufficient light comes from these lamps to permit reading ordinary newspaper print quite easily. Likewise light from the projector group reaches to considerably over 1,000 feet north and south along the beach. The general character of the illumination is indicated from the two accompanying night views. It is impossible to secure a photograph, however, that gives an adequate idea of the effectiveness of the lighting. The three diving platforms, as well as the rowboats of the life guards, stand out very conspicuously, and each bather can be clearly located anywhere within the life lines of the beach. The side rays from the lamps illuminate the entire reach of water between the island and the bathing beach, and also the open water inlet connecting with Lake Michigan. It is proposed in the near future to add to this installation a tower on which will be mounted a concentrating flood-light projector, which normally will be directed upon the elevated diving platform opposite the middle of the beach. It will be arranged, however, so that an operator can readily direct the concentrated light from this lamp upon any rescue parties so as to still more intensely illuminate the zone in which they may be at work. This projector will probably be equipped with a 1,000-watt lamp. The tower will be placed immediately back of the battery of projectors on top of the central building on the beach. Current for operating the lamps in this installation is obtained from the Sanitary District of Chicago. The installation was designed and put in under the supervision of C. H. Shepherd, electrical engineer of the Lincoln Park System.

Lighting of Clarendon Municipal Beach.

A few miles north of Diversey Beach there has been developed a fine new bathing beach, which likewise is a public beach, in this case under the supervision of the Small Parks Commission of the City of Chicago. The locker and other buildings of this beach have recently been completed and contracts have been let for equipment for flood lighting. A trial installation of this was made late last summer before the beach buildings were completed. It consisted of 10 projector lamps mounted on top of one of the buildings of the pumping station that adjoins the beach. The illumination was found to be so effective that it was decided to make a permanent installation this summer. A brief description of this trial installation appeared in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of September 11, 1915. When diving in the water and looking towards the lamps it was possible to see the bottom of the lake easily, which showed that considerable light was transmitted through the water on account of the high mounting of the lamps, and that rescue work would be very greatly facilitated by the installation. Last fall an installation of flood lighting was also tried out at the playground of the Graham School, where lamps were installed at a height of 65 feet and gave a very satisfactory illumination to the entire grounds.

From these experiences it was decided to mount the projecting lamps at the Clarendon Beach on top of two structural-steel towers, each about 85 feet high. These towers will be 775 feet apart and near the north and south limits of the beach, and they will be placed about 100 feet from the edge of the water. On top of each tower will be a platform upon which will be mounted 10 Sunlight projectors made by the American Lighting Company, and each using a 1,000-watt gas-filled tungsten lamp of standard type. These lamps will be adjusted so that their light covers a total area of about 500,000 square feet, or between 11 and 12 acres. This will include the sand beach, which is about 800 feet long and 100 to 130 feet wide, and an expanse of water from 250 to 500 feet wide. It is expected to have the permanent installation completed within a few weeks. At the present time a temporary installation has been made of seven projectors on top of the central building and four on the parapet of the promenade. Current is supplied by the Commonwealth Edison Company.

South End of Clarendon Beach Flood-Lighted from Temporary Installation.

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Power Campaign in St. Louis.

The accompanying illustration shows one of a series of advertisements published by the Union Electric Light & Power Company, of St. Louis, Mo., in a campaign to secure power business. Testimonials from satisfied customers, usually the head of some prominent establishment, form a conspicious feature of each advertisement. It has been the experience of the St. Louis company that publicity of this character not only brings excellent returns, but also is pleasing to the customers featured in the advertising.

In a large progressive city like St Louis smoke cannot be entirely eliminated but by using
UNION ELECTRIC Power Service
SMOKE
CAN BE REDUCED
A Letter from One of Our Power Users
"UNION ELECTRIC" LIGHT AND POWER COMPANY
12th and Locust Streets

Advertisement of Union Company.

Worcester Central Station Expands.

A remarkably prosperous condition was indicated by representatives of the Worcester (Mass.) Electric Light Company at a public hearing held June 22 before the Gas and Electric Light Commission, on a petition for authority to issue 2,000 shares of new capital stock, at $200 per share, to pay for plant extensions. During the past fiscal year a regular dividend of 12 per cent and an extra dividend of 10 per cent have been paid, and the maximum incandescent lighting rate reduced from 10 cents to 8 cents per kilowatt-hour, effective July 1. The estimated reduction in gross revenue due to the cut is about $25,000; in addition, the contract price for street lighting has been reduced about $18,000 per year, on the former basis.

At the hearing, Fred H. Smith, assistant general manager, stated that during the coming year line extensions to cost between $100,000 and $125,000 are planned.

The company's business is increasing so rapidly that large extensions, both underground and overhead, are necessary and will be made.

During the fiscal year to June 30, 1915, the company made additions to plant amounting to $359,504, and during the fiscal year just closed $376,632 more has been added. Further additions to the Webster Street generating station are estimated to cost about $81,675, and apparatus ordered or contracted for, $238,564.

The city recently decided to arrange for 150 additional luminous arc lamps, and these will be started in the early fall.

Newly Formed Spokane Company to Reduce Rates.

The Merchants Central Heating Company, of Spokane, Wash., has been succeeded by the Spokane Heat, Light & Power Company, which was organized recently, and which filed articles of incorporation June 23. The company, according to Manager Darrow, was formed to take over and operate the properties of the old Merchants Central Heating Company, and will take over the work completed, and will operate under the new name. The company is reported to have the financial support of the Westinghouse Electric & Manufacturing Company. It is capitalized at $3,000,000, divided into $1,000,000 common and $2,000,000 preferred stock. The incorporators are: Harry A. Flood, president; R. J. Danson and H. B. Ferris, of Spokane, and R. E. Field and H. P. Richards, of Cincinnati.

Manager Darrow recently made the following statement: "The new company has been provided with ample capital for carrying out all the plans of the old Merchants Central Heating Company, and for an enlargement of the electrical program which ultimately aims to provide the whole city with its electrical service. We plan to give service at every point within the city limits, but for the present, whether we shall extend our lines out into the rural districts is uncertain." He announced a new domestic rate of 6 cents for the first 20 kilowatt-hours, and 3 cents for all energy used over that amount. This is the lowest rate the city of Spokane has ever known. The minimum bill will be 50 cents. There will be no service charge, and the deposit of $5 heretofore required will be abolished.

Special July 4 Lighting in New York.—The Committee on Illuminations of the Mayor's Independence Day Committee is deserving of great credit for the elaborateness of the special illumination in the five boroughs of New York, on July 4. There was a total of approximately 55,000,000 candlepower of special lighting which was donated by the lighting companies of the various boroughs. It consisted chiefly of outline lighting and flood lighting of public buildings and monuments, colored streamers and Japanese lanterns, brightly lighted band stands, outdoor motion-picture shows, and neighborhood and settlement dances in the streets. Over 120,000 candlepower in outline and flood lighting was used at the old City Hall and the Soldier's and Sailor's monument on Riverside Drive had a battery of powerful flood-lighting units turned on it from all sides, bringing out its beautiful architectural features. The light on the monument totaled 1,100,000 candlepower.

Suggestions for Central-Station Advertising

By Charles H. Seaver

Knowing what to say is just a part of the problem of advertising. It is equally as important to know how to say it, or, in other words, how to prepare the copy so that the message will be read. This article, which is the last of a series dealing with various aspects of central-station advertising, embodies many valuable suggestions concerning the proper use of type and illustrations.

TO the man responsible for the advertising of the central station, some knowledge of type and illustration are as necessary as is a knowledge of what to say in type and how to say it. Even in the case of the smaller stations where the manufacturers' "ready made" advertisements are secured, printed announcements and special advertisements are a necessary part of the business-getting routine.

Choice of type in an advertisement may seem a trivial thing, especially in the case of newspaper copy, yet it deserves vastly more attention than it usually gets. It is in many cases left to the judgment of the printer, who in turn leaves it to the discretion of the compositor. Thus the result may be very different from what was expected. Consultation with the printer is an excellent thing, but it is best to have some knowledge of type and arrangement, and to set a good standard that the printer must meet.

Selection of Type.

No rule can be set down either for type or border of the newspaper copy, but the very art in choosing both is to make them secondary to the message that is to be carried. The thing the advertisement has to say is the all-important thing, so the border and type that harmonize and offer the least distraction from the body may be set down as the best type and border for that particular piece of copy. For this reason it is well to avoid types of fantastic body, very bold or with a surplus of elaborations. In the same way, the effect of simplicity is maintained by avoiding a number of different styles of type in one advertisement. Even in a series of advertisements a good deal is to be gained by following the same general style, and holding to one or two type faces throughout.

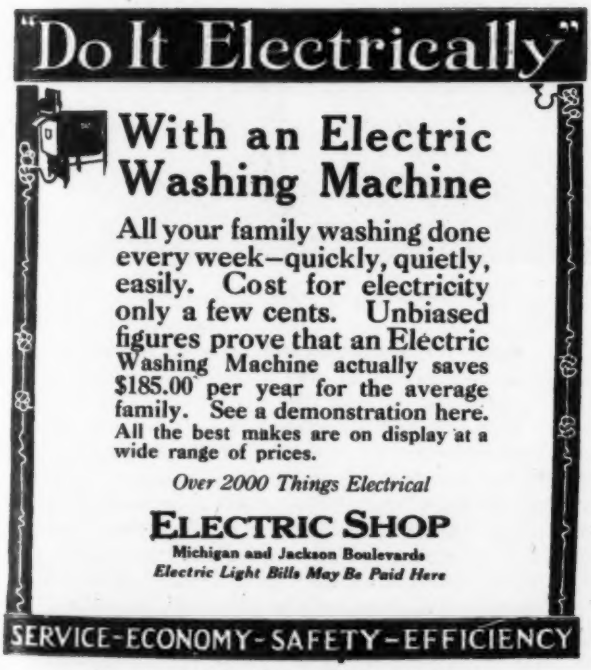

"Do It Electrically"
With an Electric Washing Machine
All your family washing done every week—quickly, quietly, easily. Cost for electricity only a few cents. Unbiased figures prove that an Electric Washing Machine actually saves $185.00 per year for the average family. See a demonstration here. All the best makes are on display at a wide range of prices.
Over 2000 Things Electrical
ELECTRIC SHOP
Michigan and Jackson Boulevards
Electric Light Bills May Be Paid Here
SERVICE-ECONOMY-SAFETY-EFFICIENCY

Fig. 1.—A Well Arranged Advertisement.

Just as it has been proved that the plainer and more open faces of type are noticeably easier to read, so it has been definitely demonstrated that black letters on a white background are easier to read than white letters on a black background. This latter style is sometimes adopted by the advertiser for the sake of getting a striking effect. It undoubtedly does make the advertisement conspicuous, but whether this compensates for the loss in "readability" is very doubtful. When sparingly used, these letters are attractive, and doubtless do really add something to the effect. A good example of white letters carefully used is shown in Fig. 1, in which the reverse zinc etching idea is carried out through the entire border.

Do you enjoy the many comforts of
ELECTRIC LIGHT
in your home? No? Then, why let another week pass?
HAVE YOUR HOME WIRED NOW
Write today; or, 'phone Randolph 1280—Contract Department, for full particulars about our house-wiring offer—two years' time for payment in equal monthly installments.
Commonwealth Edison Company
120 West Adams Street
Trade travels toward the light.
Prove it by using Tungsten Electric Fixtures.
Our special offer to store owners allows you to rent Tungsten Electric Fixtures for $1 or $1.25 a month according to style and size of fixture. We provide and erect the fixtures, do the wiring necessary, attend to lamp renewals, etc., without charge. Electricity on regular meter basis.
Write today; or telephone Randolph 1280, Contract Dept.
Commonwealth Edison Company
120 West Adams Street

Fig. 2.—Plain Copy Suited for Small Space.

Display lines, or display heads are not always necessary, yet they do undoubtedly add a great deal to the attention value of an advertisement, and this value is largely dependent on the type that is chosen and the typographical arrangement in general. Contrast is valuable. It is a mistake to try to display too many points. Rather the main point and the few principal features should be made to stand out. The result may be brought about as much by keeping the body of the advertisement simple, as by increasing the boldness of the heading.

Very carefully carried out experiments show that the human eye can take in only three printed words at a glance. Thus the important words, or the main phrase that stands out above the plain body, especially if there is an appropriate and attractive picture, are fairly sure to be read. It is worth while to have the details of composition supervised by someone who is competent to judge the excellence or lack of excellence of typographical arrangement. In Fig. 1 note that the words "Do It Electrically" can be taken in at a glance, as are each of the other display lines.

The small advertisement, Fig. 2, shows attractive typographical arrangement of a kind that can be used in spaces too small for an illustration. It is brief, to the point, and is set in type large enough to be easily readable. It is a good example of the small single-column advertisement.

The point system, the column inch and the agate line are the units of measurement of the advertising man, and it is worth the while of the man concerned with central-station publicity to have at least a bowing acquaintance with these units. A point, one seventy-second of an inch is the basis of all type sizes. This article is printed in eight point; that is, the body on which the type is cast, not the letter itself, is eight seventy-seconds of an inch in height.

Newspaper advertisements are measured by the agate line, or by the column inch, there being 14 agate lines to the inch. Thus a ten-inch advertisement might be in a two-column space five inches in height, or a single-column space double the height. Charges are made sometimes on the basis of agate lines, and sometimes in inches; measurement in either case being per column.

The buyer of printing for booklets has to rely a good deal upon the printer, so here certainly is a place to buy only the best. A piece of work nearly always comes to more than the original estimate and no little experience is required to say whether an excessive charge has been made for necessary corrections and alterations or not. When a number of bids are called for on a job there is sometimes such a great variation of figures as to surprise even those who have had considerable experience in this line. As in everything else the buyer pays for very nearly what he gets, and the piece of work given out at a very low price is apt to have a cheap appearance. It is worth while to find a printer who can be trusted to turn out a grade of work that measures up to the central-station standard of dignity, and allow him to bill the work at cost plus his profit of ten per cent.

Illustrations.

Probably more advertisements have been spoiled through poor illustration than ineffective type display, yet a suitable picture offers the greatest of opportunities to make the advertisement attractive. The ability of the artist to show electric light and things electrical in attractive surroundings can be used to its fullest extent only through engraving, yet the suitability of the engraving is sometimes so misjudged that instead of an attractive picture there appears a muddy spot that lends anything but desirability to the service or utensil advertised.

Zinc etchings, the kind best suited to the newspaper, are made from an original drawing in solid blacks and whites. That is, the use of the middle tones is out of the question, and it is impossible to make a zinc etching from a photograph, crayon drawing or wash drawing. However, it has the merit of good printing qualities, and will make a showing on even the poorest grade of paper. It has also the merit of lower price. While very elaborate and beautiful pen and ink drawings and zinc etchings are made, it is for the central station essentially a process for newspaper work. It is the opinion of the writer that except in special cases the pen and ink drawing and the zinc etching should be used exclusively in the illustration of the central-station newspaper advertisement.

The halftone engraving, which is etched on a plate of copper instead of zinc, has a vastly wider field, inasmuch as it permits the reproduction of photographs, drawings, paintings or practically any kind of "copy." It reproduces, not in the positive black and white of the zinc etching, but in the innumerable shades of the photograph, or drawing. Its limitations exist only in the kind of paper on which it may be printed.

Both processes are of course purely photographic, but in the zinc process the light from the lens of the reproducing camera falls directly on the sensitized plate, while with the first step of the halftone etching on copper, the light is broken into many light and dark spots by a diamond ruled glass, called a screen. In both processes the result is to secure a negative in which certain portions to be printed appear transparent, while the other parts are perfectly black.

The accompanying illustration, Fig. 3, gives an excellent idea of the appearance of the black dots and intermediate white spaces in a halftone engraving. It may be seen from this that each black spot is perfectly black, while the white spaces carry not the faintest trace of ink. Thus the grays and middle tones of a halftone are only apparent and result from the inability of the eye to distinguish the fine dots from the white spaces that separate them. It is by the distance between the black dots, or rather by the number of them to the linear inch that the fineness of screen is designated. The halftone screens commonly in use vary from 60 lines to 150, the former being used only in making halftones for newspaper work, and the latter for fine enameled or coated papers.

Fig. 3.—Dots of a Half-Tone Engraving.

The outline of type sizes and of engravings has been necessarily brief, but it is well worth the time and effort of the central-station man delegated to look after these matters to have a fair knowledge of the various processes and measurements in common use. If the few suggestions given in this and previous articles are the means of bringing about a closer study of advertising by central-station commercial men they will have fulfilled their purpose. The many advertising mediums mentioned and many more which could not be gone into here, are a force in the development of the central-station industry that cannot be neglected, and for the man who studies the reasons why one advertisement is good and another bad for his company, how to write the good ones, or choose them, and to direct and watch the detail of publicity there awaits a valuable place. The opportunities of the central-station advertising man are as wide, and his duties as varied as those of the advertising manager of a large manufacturing company. Printed salesmanship is a factor in central-station load building that no company can afford to neglect.

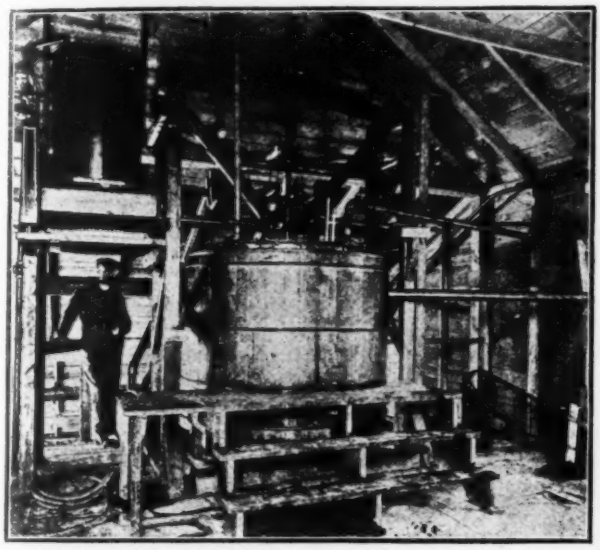
POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

ELECTRICITY IN THE MANUFACTURE OF EXPLOSIVES.

Description of the Processes Involved and the Advantages of Central-Station Service.

There has probably never been a time in the history of the country when so large a quantity of explosives is being manufactured as at the present time. The principal



Motor-Driven Nitrating Vessel.

reason is, of course, the European war, but some of the demands may be attributed to large municipal and engineering undertakings. The explosives industry offers splendid opportunities for the use of central-station service and electric drive, as well as some applications of electric heating. Although generally located in isolated places, plants of this kind are generally within a reasonable distance of some public-utility company's transmission system.

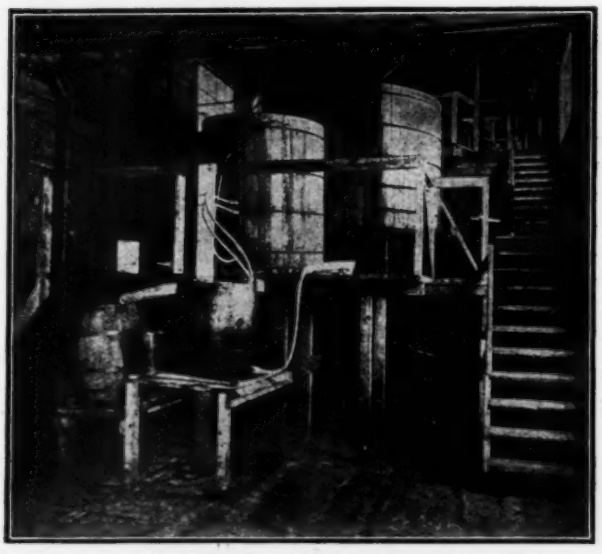
The fact that the buildings comprising an explosive plant must be isolated from each other on account of safety is a strong argument in favor of electric drive. The dangerous character of the work and the nature of the materials handled makes it imperative that all danger of sparks, hot cinders, etc., be removed and that heavy line shafting and large belts be eliminated on account of the danger of heated journals and static discharges. Another important feature is that while grinding powder under the edge runners, despite all precautions, the mass frequently explodes and for this reason no one is allowed in the grinding room while the machines are in operation, the mills being started from a distant point. Here is where electric drive plays an important part, as motors may be easily and safely controlled from a distant point.

Machines Employed.

The machines used including ball mills, pumps, edge runners, nitrating vessels, etc., are well adapted to individual drive. The characteristics of the machinery are such that there is no sudden power demands while in operation so that the squirrel-cage induction motor is well adapted to this class of work. Where a large number of belts and shafts are used, flying dust and dripping oil cause danger of spontaneous combustion which would be almost certain to prove fatal to employees. By the use of motor drive cleanliness is aided, better ventilation is secured, as well as improved natural lighting. It also reduces the number of obstructions to free exit from buildings, makes the control of machines easier and eliminates mechanical devices for varying speeds and shifting belts. There are, of course, the usual advantages of reduced friction, increased production, and decreased cost of upkeep.

Explosives are divided into several classes for military, naval and civil purposes, the principal products being, gun powder, nitroglycerine, nitrocelluose or gun cotton, smokeless powder, nitro starch, dynamite, glyoxeline, lithofracteur, duolin and fulminants. The various fulminates of mercury, silver, copper, etc., although very powerful agents, are too liable to accidential explosion for practical use, except in small quantities, as priming for percussion caps, fuses and similar uses.

Gun powder is a merchanical mixtures of potassium nitrate (salt peter) carbon and sulphur, in proportions usually varying but little from 75, 13 and 12 respectively. The manipulations of the manufacture consist, in general



Tanks for Treating Nitroglycerine.

terms, in very finely pulverizing the ingredients, thoroughly incorporating them, compressing them into a cake, granulating it, separating the various sizes of grain by sieves, glazing, drying, and finally removing all dust by the use of fine sieves.

In the manufacture of gun powder the materials are first pulverized in revolving drums containing bronze balls.

For this operation they are taken in pairs, salt peter and sulphur, salt peter and charcoal, charcoal and sulphur. The different pairs are then mixed in proper proportions and further ground in the ball mill. In this condition the powder is known as "meal" and may be used without further treatment for making fireworks or fuses. It is not, however, in a form suitable for blasting or for use in firearms.

The grinding in the ball mill serves merely as a preliminary mixing and to secure a more thorough incorporation of raw materials, the meal is next ground in a mill provided with heavy edge runners. This is a mill extensively used in many industries and consists of two heavy, broad-edge wheels, connected by a short axle which is caused to revolve horizontally by an upright shaft. The two wheels or runners travel around a circular basin which contains the material to be ground, and which is subjected to a combined crushing and grinding action. This operation lasts about four hours. Before grinding under the edge runners about ten per cent of water is added to the powder to reduce the danger of explosion by friction. In spite of all precautions the mass frequently explodes and for this reason no person is allowed in the grinding room while the runners are in operations, the mills being started and stopped from a distance.

After the grinding is complete the mass is pressed into sheets and the sheets subjected to further pressure and consolidation in a hydraulic press. The pressure in these presses varies from 100 to110 atmospheres, the powder remaining in the press from one-half to two hours. The cakes are next broken up and passed through sieves as already explained.

Nitrocellulose is now the chief material used in the manufacture of military and sporting powders throughout the world. Cellulose in the form of wood pulp, tissue paper, cotton wool, or cotton waste is impregnated with sulphuric and nitric acids. This combination is then rinsed in a large volume of water, and dried three or four times by a centrifugal apparatus. Next it is placed in a pulping engine, like those commonly used in the manufacture of paper, and reduced to a state of fine subdivision. It is then transferred, in quantities of at least 1,000 pounds to a poaching engine, where it is heated for about 48 hours until it remains uniformly suspended in a large volume of warm water, continually renewed, and finally rendered slightly alkaline. It is then dried in a centrifugal machine and afterward moulded in desired forms under a pressure of from 4 to 6 tons per square inch.

Nitroglycerine is composed of nitric acid, sulphuric acid, and glycerine. The sulphuric acid is used to take up the water of reaction. The glycerine used is the ordinary glycerine of commerce extracted from fats. The glycerine is added to the mixed acids and the glycerine nitrate is separated from the remaining acids, after which it is purified. The manufacturing methods vary widely, but the general principle is the same in all cases. In a nitrating vessel the glycerine is brought into contact with the mixed acids, the nitrating vessel being provided with a thermometer, cooling coils and an agitator. The contents of the nitrating vessel is drained into a tank until the nitroglycerine separates from the acids. As the glycerine is lighter than the acids it collects at the top and is drawn into a second vessel where it is washed to remove most of the adhering acids. A safety tank full of water is near at hand so that the contents of the nitrating vessel or the first tank can be drained into it in case the liquid begins to decompose with violence. In one plant, for one charge there is used 4,000 pounds of mixed acids and 635 pounds of glycerine. The mixing takes place at a temperature of 65 degrees Fahrenheit, takes about 40 minutes and yields 1,400 pounds of nitroglycerine. After separation the glycerine is washed twice with small amounts of water followed by a washing in a weak solution of sodium carbonate and a washing in water maintained at 90 degrees Fahrenheit to remove the alkali.

ANALYZING THE ISOLATED-PLANT ENGINEER.

Much Information Can Be Gained by a Study of the Engineer and His Methods.

By H. A. Cozzens, Jr.

Frequently there appears in technical papers advice to power solicitors dealing with the ways and means of inspecting and rating isolated plants. The most stress is laid on analyzing technical details with no attention being paid to the importance of sizing up the engineer in making the preliminary investigation of the plant. It is of primary importance that the power solicitor come in contact with the engineer before attempting the technical study of the plant and its operation.

It is not unusual to find that the efficiency of the plant is reflected in the engineer. It is diplomacy whenever starting an investigation of a plant to spend some time in conversation with the man in charge. This is an opportunity to study the man, learn his methods and also rate his personal efficiency or ability as the plant executive. The points that should impress you first are his education and his experience. Few men who are now engineers in the isolated plants are college graduates but nevertheless it is not a difficult matter to find out whether the man learns entirely by experience or whether he allies both book learning and experience. Too much credit cannot be given the engineer who has grasped the opportunity for study and although handicapped by poor apparatus is putting up a stern fight against the central station. In many cases the firm will subscribe for technical papers which are seldom removed from their wrappers by the engineer. Unless laziness intervenes, it is usually the rule that the man who is a close student is able to maintain the highest plant efficiency.

Another quality to search for in the engineer is his ability to handle men. If the employees of the plant are questioned, much information as to the smoothness of operation may be gleaned. It is obvious that due allowance must be made for the knocker who may hold some personal grievance. Where there is dissension among the subordinates and a prevalence of the "let George do it" spirit there is not much room left for high efficiency as related to the human factor in plant operation.

It is needless to mention that the engineer who is neat and careful in his personal appearance usually does his work in the same fashion. Among other points may be mentioned the length of service in the present connection. the place of the engineer in the organization and the salary the man is earning. As a matter of fact a quiet little talk with the engineer often gives the power solicitor enough clues upon which to base his deductions as to the efficiency of the plant.

Massachusetts Utilities Issue Employees Stock.—The issue of 5,000 shares of employees' stock, at $10 per share, by the Greenfield Electric Light & Power Company, Greenfield, Mass., has been approved by the Massachusetts Gas and Electric Light Commission. The issue of employees' stock by the Turners Falls Power & Electric Company was recently approved by the board. In the Greenfield company case, it is proposed that the proceeds may be devoted not only to plant additions, but also to the acquisition of employees' stock. Questions as to the status of redeemed employees' stock, the source of the funds for such redemption and its re-issue after redemption will stand until the contingency arises, the Commission says.

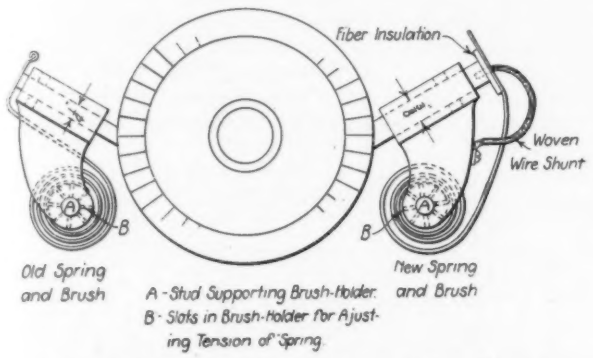
ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

CORRECTING A BRUSH-HOLDER TROUBLE.

By R. L. Hervey.

The important part brushes and brush holders, with their proper springs and shunts, play in the success or failure of a motor or generator is demonstrated by the following example: A five-horsepower, 110-volt motor taking 38 amperes had been supplied, when leaving the factory, with two brush holders placed as shown at the left side of the



Position of Brush Holders Before and After Change.

sketch. The holder was of the stationary-box type, each accommodating two brushes, one-fourth inch thick and five-eighths inch wide, which had a current density of 122 amperes per square inch of cross section.

When the original set of four brushes wore out, they were replaced by two pieces of carbon without plating or shunts, one plain piece of carbon acting for two plated brushes with shunts. In a short while the commutator needed turning. A shoulder was left on the face of the commutator, requiring one-fourth of an inch to be taken off the width of the brush. This left a cross section of one-fourth square inch for 38 amperes, or 152 amperes per square inch. The brushes soon became so hot that they glowed or became incandescent near the commutator, causing them to burn away. The lubricating and binding material in the brush was driven off by the heat, leaving the brush in a dry, crumbling condition.

There are a number of copper-graphite brushes that will commutate 200 amperes per square inch, but 100 amperes is excessive for carbon, as this case showed.

When conditions became so bad that the motor could not be operated, it was sent to a repair shop where the brush holder was enlarged to suit a brush three-eighths inch thick. As the old springs had been in direct contact with the brush, they had heated and lost their temper. New springs, the same size as the old ones, were made and put in as shown. The reason for changing the directions was to produce a pressure in line with the axis of the brush and not against the outside of the box, as was the case with the old spring. A brush should never have two springs, as it is almost impossible to obtain a uniform pressure throughout the life of the brush. If one side bears harder it will take a larger part of the current, consequently causing uneven wear of the commutator and brush. The commutator was turned so that the full width of the commutator could be used and two brushes were put in each holder, each having a separate spring, as it should. Shunts were very carefully fastened to the brushes and a piece of fiber was attached to each spring to insulate it from the brush. This motor has now been in operation 16 hours a day for three months without trouble.

A large number of operators and users of motors think that any kind of a brush is as good as the best. If they could be taught that it is just as necessary to keep the brushes clean and free in the holder and the shunt connections tight, as it is to keep oil in the bearings, a considerable portion of the brush and commutator trouble would be overcome.

Safety Release for Motor Starter.

On all modern motor-starting rheostats provided with direct-current motors there is a "no-voltage" release coil, which is merely a magnet connected in series usually with the field circuit. This coil is placed on the surface of the rheostat and is employed to keep the handle of the arm, which is spring-tensioned, against the magnet when energized. When this equipment has been installed, it is often necessary in the case where an operator is feeding the machine that the motor controls, to turn off the current or to stop the motor in case of accident.

I have found a very good method of doing this by taking a good push button or small switch located at the point where the operator is working and running two wires directly to the retaining coil of the rheostat and connecting these two wires in multiple with the coil so that when the button is depressed it will shunt the current around

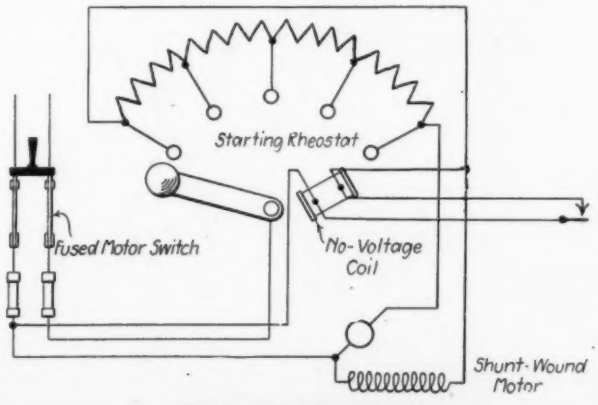


Diagram of Safety Release.

the retaining coil, thus de-energizing the magnet which will then release the arm. As many buttons as desired may be employed for the one rheostat or motor, as long as they are wired in multiple. Since the voltage across the release coil is low, it is possible to use an ordinary push button and bell wires. However, in the case of a ground anywhere in the field circuit trouble may develop and it is therefore better to use a well insulated button or switch and well insulated wires. J. Domerhuizen.

Alternating-Current Motor Windings—IV

By Justin Lebovici

This is the fourth installment of a series dealing with the windings of alternating-current motors. The present article deals with chording and skein windings. Previous installments have dealt with conductor diagrams, winding diagrams, arrangement of conductors, and different forms of connections for single-phase windings. Polyphase windings will be taken up in a later article.

Effect of Chording.

The throw y_1 of the individual coils, sometimes measured by the number of slots spanned by the two sides of the coil, plays an important part in the amplitude of the resultant voltage of a certain winding and has an important bearing on the performance of the entire machine. Figs. 47 to 62 dealt with a coil pitch y_1 equal to the pole pitch τ. In case the coil pitch y_1 is made smaller than the pole pitch τ we speak of "fractional-pitch windings" or "chorded windings."

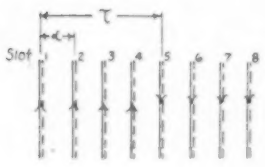


Fig. 64.

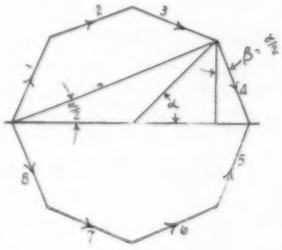


Fig. 65.

Starting again from conductor diagram shown in Fig. 64, assume a two-pole winding with four slots per pole and assume that all the slots are filled with winding. Let 1 to 8 in Fig. 64 represent the amplitude of the voltage generated in one coil side. If upper half of slot 1 and lower half of slot 5 are connected to one coil (Fig. 68) the amplitude of the voltage of coil 1, 5 will be equal to $m\ m$ in Fig. 66 or equal to twice chord 1 in Fig. 65, and we can assume same as before that chord 1 represents the amplitude of the voltage per coil.

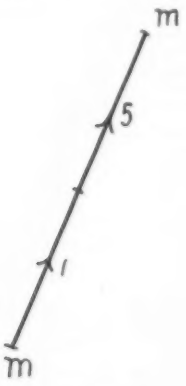


Fig. 66.

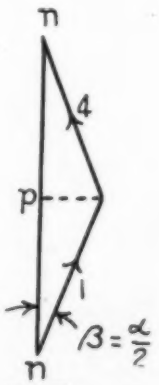


Fig. 67.

If upper half of slot 1 and lower half of slot 4 are connected to one coil (Fig. 69), the amplitude of the voltage generated in coil 1, 4 will be equal to line $n\ n$ in Fig. 67 and $n\ n$ is smaller than $m\ m$ in Fig. 66. Since $n\ n$ is proportional to 1, the chord 1 in Fig. 65 still represents the amplitude of the voltage generated in one coil.

Calling β the angle between $n\ n$ and 1 in Fig. 67, then

$$n\rho = (\text{chord } 1) \cos \beta \text{ or}$$

voltage in one coil $n\ n = 2 \cos \beta$ (chord 1). Since $\cos \beta$ is a qauntity smaller than 1, the voltage $n\ n$ is always smaller than twice chord 1, or smaller than the voltage per coil if the coil pitch is equal to full pitch.

Having assumed the pole pitch $\tau = 180°$, the slot pitch a (Fig. 63) will be

$$a = 180° \text{ divided by slots per pole.}$$

The angle β in Fig. 67 is equal to $a/2$ in Fig. 65. Having dropped back from the pole pitch $\tau = 4a$ to a coil pitch equal to $3a$, the voltage per coil has been reduced by an amount equal to $\cos \frac{1}{2}(4a - 3a) = \cos a/2$.

If in Fig. 69 we dropped back one slot, then the voltage per coil and in consequence the voltage between terminals is reduced. Since one slot pitch in Fig. 69 equals $180°/4 = 45°$,

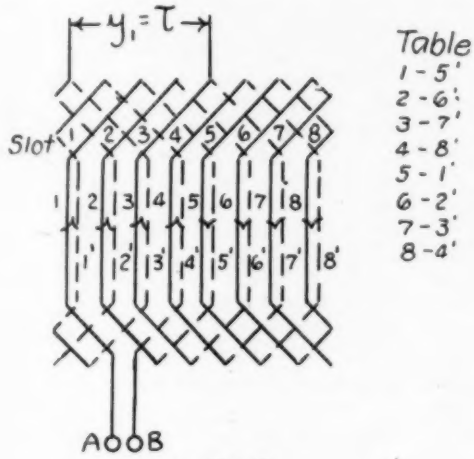


Fig. 68.

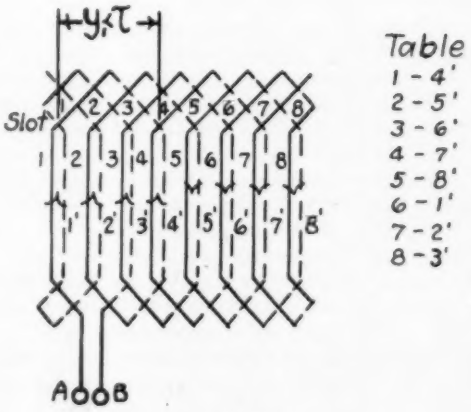


Fig. 69.

and the cosine of half 45° or 22.5° is 0.924, the voltage per coil and terminal is 0.924 times the voltage for the case of the coil pitch equal to full pitch.

In general if we drop back x slots and there are Q slots per pole, the angle β we dropped back is

$$\beta = 180x/2Q$$

and the multiplier by which the terminal voltage figured under the assumption of a coil pitch equal to full pitch, or pitch factor f_p, has to be multiplied in order to get the correct voltage can be found from Fig. 70, which gives f_p as a function of β.

Assume we had nine slots per pole, then for a full pitch coil

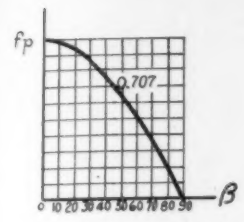


Fig. 70.

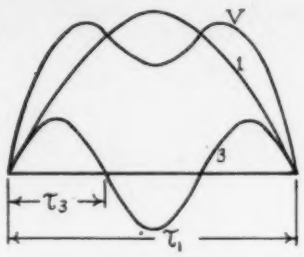


Fig. 73.

the sides of the coil would lie in slots 1 and 10. If we make the coil so that the sides of the coil lie in slots 1 and 8 the angle β is given by the equation

$$\beta=(10-8)/9\times180/2=2/9\times180/2=20$$

and from the table we find

$$f_p=\cos 20^\circ=0.94.$$

Reducing the span of the coils is in one of its effects similar to decreasing the number of wires in a coil. This is important when changing the number of poles by reconnecting the coils in a given machine without changing the throw of the coil.

Fig. 71 represents a six-pole machine with $Q=4$ slots per pole. Fig. 72 shows the same machine after it has been reconnected to make it a four-pole machine.

The number of slots per pole in Fig. 72 is six, the pitch of the coil four. In consequence we drop back $x=2$ slots and

$$\beta=180x/2Q=30^\circ$$

and f_p from Fig. 70 or from any cosine table equals 0.866. Assuming that the winding in Fig. 71 belongs to a 220-volt

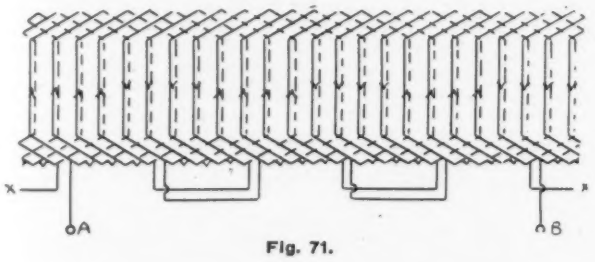


Fig. 71.

induction motor and has 240 turns between terminals AB, then the winding in Fig. 72 is equivalent to a winding of only 240 times 0.866 turns or 208 turns, and if connected to a 220-volt line the flux will be increased in the ratio of 240 to 208, and if the iron circuit is not designed to carry the greater flux, the machine will overheat, though the current in the winding due to the load remains unchanged.

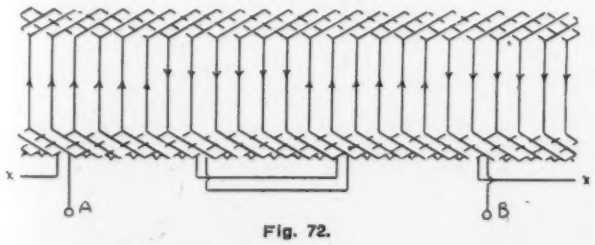


Fig. 72.

Fig. 72 has been drawn a little different from Fig. 71, the upper and lower coil side in the same slot being indicated by one single line instead of by a full line and a dotted line; otherwise the same convention has been used and the diagram will be easily understood. This change in the drawing of the diagram has been made in order to illustrate various shop and drawing-room practices.

A change in the number of poles in a single-phase motor will arise mainly in connection with motors having a short-circuited rotor, either a squirrel-cage or slip-ring rotor, or a short-circuited commutator-type rotor, in order to change the speed of the motor to meet new requirements. A change in the stator connections is all that is necessary in this case. In case the motor starts as a commutator motor, a change in the brush rigging will also be necessary. The throw of the coil is usually the limiting condition and this matter will be taken up again when discussing the question of changes in motors. If only part of the slots are filled with wire, a rearrangement of the coils will be necessary besides the change in end connections. The advantages of chorded windings are, besides reduced length of winding heads, reduced leakage and the elimination of certain higher harmonics, resulting in a better

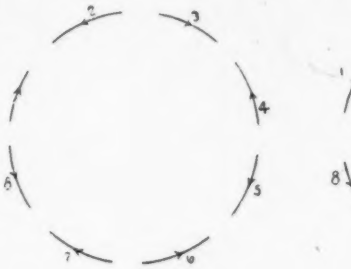


Fig. 74.

Fig. 75.

performance of the machine. In this connection I may mention cases known to the writer where induction motors which would absolutely refuse to start, due to the predominance of a certain higher harmonic, would start and operate satisfactorily after the chording of the winding had been changed.

The reduction of the higher harmonics can be easily explained in view of what has been said in connection with the pitch-factor of chorded windings.

Assume that the shape of the voltage curve V is such that it can be considered the resultant of the two sine curves 1 and 3 in Fig. 73. The curve 1 we imagine generated by a number of poles equal to the number of poles in the machine under consideration. The curve 3 we imagine generated by a num-

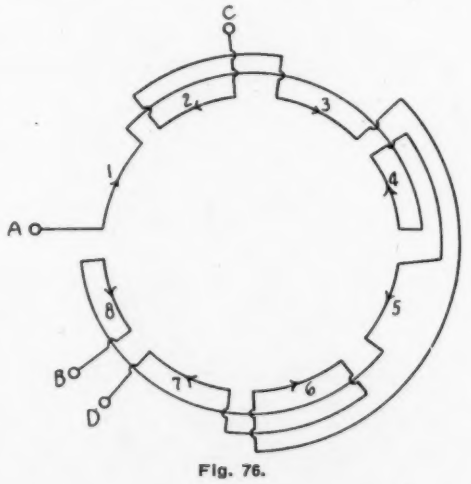


Fig. 76.

ber of poles three times greater than the number of poles in the machine. The curve V in Fig. 73 is said to be made up of two sine curves; the curve 1 or the fundamental and the curve 3 or the third harmonic.

Dropping back one-third of the pole pitch τ, the pitch-factor f_p becomes equal to

$$\cos 180/6=\cos 30^\circ=0.866.$$

The pole pitch τ_3 of the third harmonic being one-third of τ_1, it is evident that we dropped back 180 electrical degrees for the third harmonic and the pitch-factor is cos 180/2=0, or the third harmonic is entirely eliminated.

Windings to Give Two Sets of Poles and Two Speeds.

The speed of an induction motor n_1 is dependent upon the

number of poles in the primary winding and the frequency. If f represents the frequency and p the number of pairs of poles,

$$n_1 = 60f/p.$$

Hence by changing p or the number of poles, the speed of the motor changes. This change can be accomplished by dividing the windings in groups and changing the direction of flow of current in some of the groups.

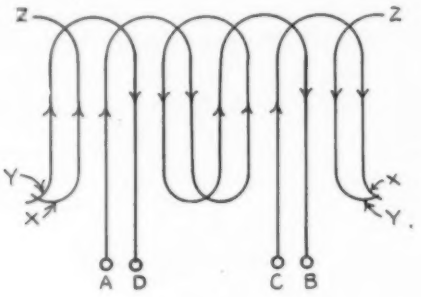


Fig. 77.

Fig. 74 shows the driection of flow of current in the different groups of an eight-pole machine. Fig. 75 shows the direction of current in the same groups for a four-pole machine. We notice that in groups 1, 4, 5 and 8 the direction is the same in Figs. 74 and 75, while in 2, 3, 6 and 7 it is reversed. We can then connect groups 1, 4, 5 and 8 permanently and 2,

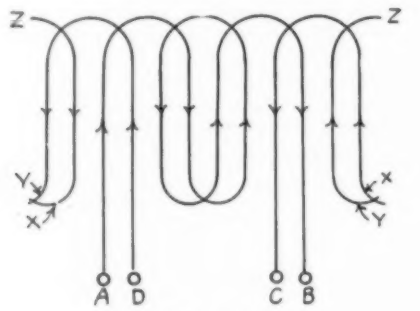


Fig. 78.

3, 6 and 7 and bring out four leads. By reversing two leads the number of poles is reduced to half.

The same procedure can be used in all cases. Divide the winding in a number of groups corresponding to the larger number of poles. Separate the groups in which no change in

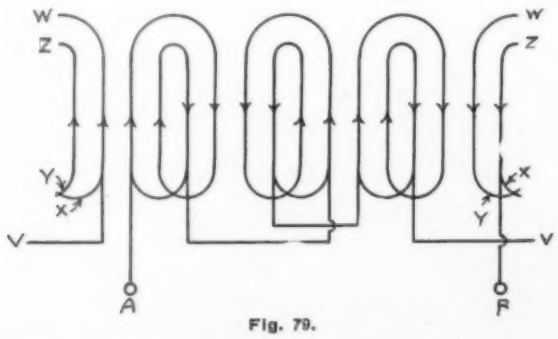


Fig. 79.

direction of flow takes place from the ones which change in direction and make the permanent connections. The coil pitch may be chosen half way between the greater and smaller number of poles, or, if the machine operates the greater part of the time at one speed, approach the coil pitch corresponding to this number of poles.

It is advantageous in machine working with two sets of poles to fill all slots with winding, otherwise the operation will not be satisfactory at one speed.

Fig. 76 shows the connection diagram for Figs. 74 and 75. Connections *ABCD* give an eight-pole winding. Connections *ABDC* give a four-pole winding. If we connect *AD* together and *BC* together and make them leads, we also obtain a four-pole winding. Advantage has been taken of this re-arrangement of windings in the Deri motor, which consists of a stator winding as shown in Fig. 76, and a rotor of the commutator type

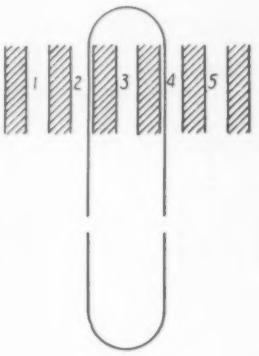


Fig. 80.

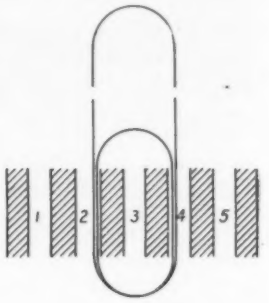


Fig. 81.

provided with equipotential connections for the lower number of poles. The motor starts on the lower number of poles as a repulsion motor, the equipotential connections being inactive. After the motor reaches the speed corresponding to the lower number of poles, the winding is changed to the higher number of poles, the equipotential connections acting as short-circuits for the rotor winding.

Figs. 77 and 78 show connection diagrams suitable for a change from four to six poles. Connections *ABCD* in Fig. 77 give four poles. Connections *ABDC* in Fig. 78 give six poles.

Skein Windings.

Fig. 79 illustrates a type of winding used in small low-voltage machines. This winding is formed by taking a skein of wire and looping it backward and forward into the slots, thus

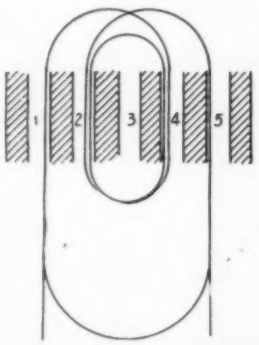


Fig. 82.

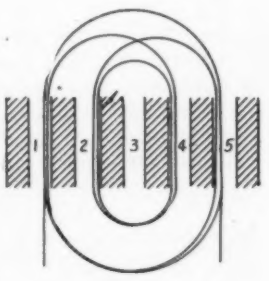


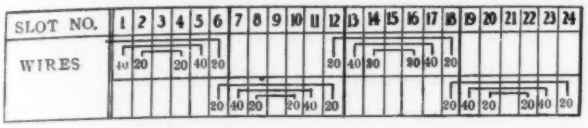
Fig. 83.

eliminating joints. Due to the fact that there is a high voltage between turns and to the difficulty of handling the wire, this winding is limited to fractional-horsepower low-voltage motors and to wire smaller than No. 18 B. & S.

In Fig. 79 we assumed a four-pole machine and four skeins. It is advantageous to use a long skein and go several times through the same slot. Figs. 80, 81, 82 and 83 show how the skein is looped backward and forward in the slots during the progress of winding.

The accompanying table gives the winding information for a four-pole skein winding placed in 24 slots and giving 80 turns per pole in series. The skein may have 10 or 20 turns in the latter case, there being twice as many loops as in the former.

The windings described in the preceding pages are used in the armatures of single-phase generators, also in the primaries of certain types of single-phase commutator motors, of which a good illustration is the repulsion-start induction motor, in



which all commutator bars are short-circuited after the machine has reached normal speed.

These windings are interesting also because they lead to a better understanding of the polyphase windings and because a combination of these windings is used in all types of single-phase motors, such as Atkinson repulsion motors, neutralized series motors, repulsion-induction motors, etc.

A winding with leads brought to a commutator can be considered as a polyphase winding, the number of phases being equal to the number of commutator bars per pole. In consequence we will treat these windings when we treat the closed polyphase windings.

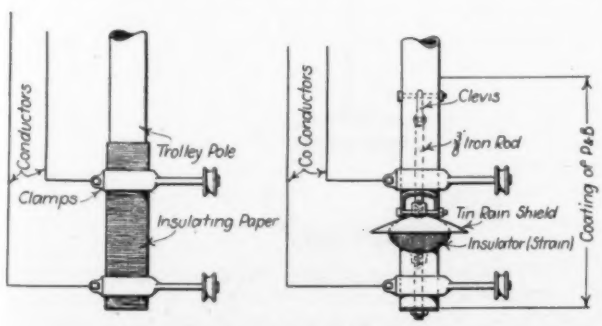
When commutated current and single-phase current are to be obtained from the same armature, closed windings are used, which will be treated when describing the windings employing commutators.

Insulating the Trolleys of a Traveling Crane.

Some interesting notes on the wiring of traveling cranes were published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of March 4 and April 8, 1916, to which I wish to add the following:

Some time ago I was called upon to wire up a crane on a dry dock which was, of course, exposed to the influence of the sea air. This crane was furnished with trolley poles consisting of ordinary iron pipe wrapped with insulating paper, as shown in the first diagram, the makers of the crane evidently considering this insulation to be ample. However, in a few days the moist and salty atmosphere, aided by heavy rains, began to act on this insulation which resulted in a complete short-circuit, tying up the whole works. The crane makers insisted upon rewrapping the pole with the paper, which again broke down.

I was then called upon to design and install a new type of trolley pole, shown in the second diagram, which proved to be thoroughly satisfactory in all weathers and under all conditions. The voltage on this installation was 550 and how the makers expected the paper to hold up is past me.



Insulation of Crane Trolleys.

The strain insulator was used to electrically separate the lower end of the pole into two parts. This insulator was bolted in place and kept from turning as shown. An inverted saucer-like tin cover served as a rain shield. We used trolley supports similar to those described by W. D. Wilson in the issue of April 8, with the exception of the curved iron bars for replacing the wire when it has jumped the supports. The idea of these bars is an excellent one and I shall certainly make use of it the next time I wire a traveling crane.

This trolley insulation has now been in use for over two years and has given perfect satisfaction.

John Shortt.

Among the Contractors.

The contract for installing electrical-lighting features at Columbia Beach, near Portland, Ore., for the Columbia Beach Amusement Company, has been awarded to the Ne Page & McKenna Company, of Portland and Seattle.

Frank Simons and Frank Schorck have affirmed ownership of the Simons-Schorck Electric Company, 626 West Jefferson Street, Louisville, Ky.

The Bell Telephone Company has awarded a contract for a new exchange building on King Street, Pottstown, Pa., to F. H. Keiser & Company, Pottstown, at a cost of $40,000. A similar amount will be expended for equipment.

The Ewart Electric Company, of Astoria, Ore., according to reports, is doing considerable business, and has recently secured several contracts which insure continued activity for several months to come. A majority of the work of the company is being performed in the communities of Warrenton and Hammond. John Douglas is manager of the company.

The City Commission of Lexington, Ky., has contracted with the Beard & Lyons Company, electrical contractors, to rewire the city market house and armory. The contract provides that the old wiring will be changed so as to make the installation confirm in all respects to the Fire Underwriters' Code.

The Gate City Electric Supply Company, Pocatello, Idaho, recently moved its place of business from North Arthur Street, where it has been located for the past two years, to a new location on South Main Street. The company has made improvements to the structure which it will occupy and has fitted up a very attractive electrical shop.

Charles Lee & Son, 221 South Main Street, Kendalville, Ind., have recently engaged in the electrical contracting business and have already secured several contracts in that town and vicinity.

Russell & Company, 444 Columbus Avenue, New York City, have the contract for the large fireproof farm buildings at Oyster Bay, L. I., to be erected for W. R. Coe. These buildings, 400 feet in length and two and one-half stories high are entirely fireproof, being constructed of concrete and terra cotta. The wiring is in rigid steel conduits, with slate panelboards and switchboard in fireproof cabinets. The power is two phase, at 220 volts. The electrical contract includes high-tension feeders of paper-insulated, lead-covered, 5,000-volt cable, installed underground in three-inch tile conduit. Each building group has its own transformer vault built in the cellar. Intercommunicating telephones are installed, and notwithstanding the fact that these are fireproof buildings, complete fire-alarm systems are included. Push buttons and call bells are installed, the wiring being in rigid iron conduit.

DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

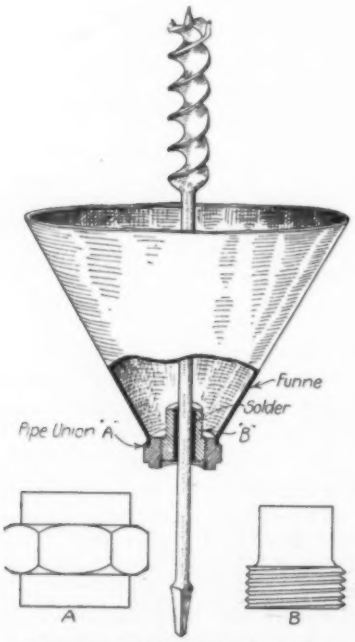
Locating Place to Bore Hole.

In wiring old houses where the partitions are closed, that is, covered with beams at the level of the floor, thus making it necessary to bore holes for wires going to switch or wall outlets, it is sometimes hard to tell just at what place the holes must be bored. To find the exact spot, I drive a three-inch finishing nail through the ceiling, just above the outlet and close to the wall. Then finding the place where the nail came through, I can tell just where to bore the holes from the floor above. The nail can then be carefully withdrawn and, on account of its thinness, no noticeable damage will have been done to the ceiling.

S. B. Trunkat.

Improved Dirt Catcher.

Many devices for catching chips and dirt in boring holes in a ceiling have been developed, but I have found none as convenient as the one shown in the accompanying sketch. This device is made from a qaurter-inch pipe union and a tin funnel with a 4 or 4.5-inch top. The lower end of the funnel is cut off and the burr of the union *A* is fitted and soldered in its place. The piece *B* is slipped over the end of the bit and held in place while a little solder or lead is run in between the bit as shown below.



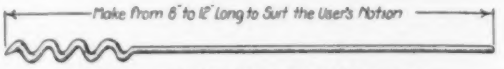
Easily Replaceable Dirt Catcher.

If this soldering is neatly done, the piece *B* can be made to uniformly surround the bit and the device will not wobble. The threads in *B* may have to be reamed out só that it will pass over the end of some of the larger bits. When the bit is not used for ceiling work, the piece *B* is not in the way. When boring holes in ceilings the funnel is screwed in place by means of part *A*. When the bit becomes worn out part *B* is removed by heating with a blow torch and melting the solder. It can then be placed on another bit in the same way and is ready for instant use. This simple device can be made at a cost of no more than 15 cents. I have used it for some time and have found it superior to anything similar. Bits can be changed with this arrangement in five minutes.

Robert W. Mallder.

A Corkscrew for Pulling Out Wires.

A corkscrew made on the end of a straight thin rod, such as a straightened pitchfork tine, may be used to fish out wires in small openings, and, in fact, is handy in many places for pulling out objects from small places. Make the spiral large enough to fit No. 14 rubber-covered



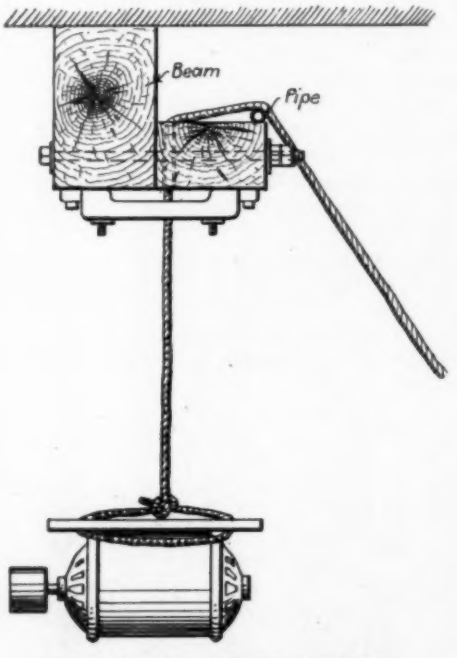
Corkscrew for Pulling Out Wires, Etc.

wire. By reaching into the opening and turning it around the wire it will take hold securely and can easily be pulled out. By slightly inclining the handle the point of the corkscrew can be easily started around the wire or similar object that is to be removed.

H. W. Dutton.

Method of Hoisting Motors.

An easy method for hoisting small motors that are to be mounted in difficult places on ceiling beams is shown in the accompanying diagram. If the beam is too narrow for the motor one can put a block on the side of it, securing it to the beam by means of two bolts running right through with a washer and double nuts. Next bore a hole through the added timber, making it large enough to take a three-quarter or one-half-inch rope; then put the rope down through this hole, using it to raise the



Scheme for Hoisting Motor Into Place.

base frame of the motor. After the latter has been bolted in place, use the rope to make a close hitch around the bottom of the motor. Then one man can pull on the rope while another man from a step ladder is guiding the motor and engaging the bolts in the base frame, thus avoiding the need for rigging up a special hoisting gear.

W. Morris.

THE DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

MERCHANDISING ELECTRICAL APPLIANCES BY MAIL.

Suggestions What to Do and What Not to Do When Conducting a Direct-Mail Sales Campaign.

By W. B. Parker.

Did you ever receive a sales letter that you merely glanced at, without receiving any definite impression of its contents, even if it was sent in a sealed envelope and under a two-cent stamp? Unless you are especially interested in sales letters from an advertising standpoint, undoubtedly you have.

Some years ago, when the writer was in the employ of a large manufacturer who did much of his business by mail, the manager said: "Isn't this a dandy letter?" and handed me a letter just received that was on the finest of stationery and was also a very clever imitation of real typewriting. It was beautifully spaced and paragraphed and started out with a quotation from Shakespeare. But on reading it I found that though flowery it did not seem to get anywhere, except in the last paragraph where "order now" was the one thing insisted on.

"Yes, fine looking letter," I said. "What do you think of their proposition? Have you decided to order?" And the manager answered, "Why—er—I don't know. What are they selling?"

You see, the general appearance of the letter impressed him because he was interested in any attractive looking sales letter, but the message intended to be conveyed was not forcibly enough presented to demand his attention.

Ineffective sales letters can be generally divided into three classes: Those that are poorly spaced, paragraphed, on cheap stationery, and badly multigraphed and "filled in," but which may be very good as to wording; those that are poorly worded and either too long or too short for the purpose intended, but may or may not be properly multigraphed; and those like the one described above that embody all that is effective in the mechanical construction and stationery used, but that do not state the message in a convincing and compelling way.

The writer will take it for granted that the readers of this publication fully appreciate the value of good stationery, good printing and multigraphing, as well as neat and accurate work on the part of the typist, and will confine his suggestions to a study of the basic elements that make for the highest percentage of efficiency. In this connection it is well to remember that poor letters sometimes pull because the recipients are really interested in the subject matter and read them carefully anyway. Also that many good letters fail to pull because the subject is of no interest whatever to the recipient. No letter can be produced that will perform impossibilities. For example, a letter offering for sale an electric washing machine at $100 and sent to laborers earning $12 a week would be an absolute waste of time, stationery and postage, no matter how well written. The success of any direct mail campaign must depend in the first place on the merit of the article or service advertised, as well as the suitability and buying power of the mailing list used.

A somewhat disputed point is the matter of the proper length of sales letters. However, the writer believes that the consensus of expert opinion is that a much longer letter may safely be employed when writing to consumers, especially ladies, than is the case when writing to business men. In any case the letter should not be longer than is necessary to tell the story in a clear manner.

In order to induce a careful reading of the letter the first paragraph should indicate financial benefit to the reader. The opening paragraph may be striking and appear effective, but it is not so effective as it might be if the element of benefit to the recipient is left out. In the case of an electrical dealer seeking sales, for example, do not say, "We want your business," but say "You can profit by inspecting our line of portable lamps at this time."

The body of the letter should describe clearly the goods or service offered, except that if a lengthy description is necessary it should be on a separate sheet or folder and merely referred to in the letter. For example, "The Blank electric tailoring iron is giving entire satisfaction for a large number of tailoring establishments thoroughout the country—see detailed description of this flat iron on page 4 of the inclosed folder. It will save you real money every month—improve your sanitary conditions and make your operators satisfied—see page 6 for conclusive evidence of this." Where the selling plan is of a nature to make it possible, reference to recent and satisfied patrons makes a strong ante-closing paragraph.

The closing paragraph, at least when the letter is sent to non-customers, should offer an alternative other than to order at once. Special information may be suggested that will be gladly furnished on request or a question may be asked that has no apparent bearing on the matter of ordering. For example, a dealer using letters to secure new customers might ask an opinion as to the use of electrical appliances in the reader's locality. A safe question for any wholesaler or manufacturer to ask is the dealer's opinon as to the comparative advertising value of his local newspapers. Questions will readily suggest themselves that are adapted to letters for the dealer or consumer.

Of course, where questions are asked ordinary business courtesy will suggest that a stamped return envelope be inclosed, or at least a stamped post card. The writer believes the stamped envelope to be the best in most cases and that it pays to also inclose a separate sheet for the answer to be written on, thus saving the recipient from any trouble whatever as to stationery. While this adds considerable expense to the cost of mailing it saves money on the next mailing to the same list, as a much larger percentage of answers are received. In one instance the percentage of answers was raised from about five per cent to nearly 50 per cent, merely by changing the closing paragraph so as to include a question and inclosing return postage. A man may receive a business offer many times without giving it anywhere near the same consideration that he would if he felt compelled to do something at the time of receiving the letter, and therefore became firmly impressed with the name of the firm sending the letter.

Filling the Valley of the Merchandising Curve

An Interview With Henry Cahn, Manager of the Cahn-Forster Electric Company, of Denver, Which Brings Out Modern Merchandising Methods for Keeping the Volume of Business Even Throughout the Year

"IT IS the policy of our store," said Henry Cahn, manager of the Cahn-Forster Electric Company, 201 Fifteenth Street, Denver, Colo., "to keep the volume of business just as even as possible during the entire year. Of course, our holiday trade is very large, and for about a month before Christmas business is always ahead of any other period of the year. However, outside of that it runs pretty smoothly, and that is the way we like to have it do."

It was pointed out that it took a great deal of planning and a whole lot of hard work to accomplish the feat, but the results amply repaid for all the time and labor expended. The stores that experience uneven trade are the ones that do not pay proper attention to the business as a result of not understanding electrical merchandising, or if they do understand it they do not work hard enough in carrying out what they know. When a store's business runs along in a "jerky" fashion it continually keeps those at the head of it in "hot water" and often results in failure. A store to be successful must have a system that is well planned out, and it should be applied properly.

The carrying out of such a policy as the Cahn-Forster store adheres to must have for its backbone the proper buying of stock. It is far better for a store engaged in the electrical merchandising business to under-buy than to over-stock. In the former case the dealer has the money that in the latter case is tied up in stock, and if an unforeseen occasion should arise that urgently called for money and he had to depend upon the sale of his stock to realize that money it would have to go at a lower price than it otherwise would.

Another phase of the buying problem is looking ahead months at a time and anticipating the demand. Of course, many times occasions will arise that were not foreseen, but the largest part of the coming demand can be judged with accuracy. Thus under-buying instead of over-stocking, with a close study of the market and an anticipating of future demand in buying, will give a dealer in electrical merchandise a pretty good start towards an even business the entire year round.

"After we have our stock purchased," continued Mr. Cahn, "we map out plans for informing the public about it. The question of demand has been settled before we buy, and so it remains only to let the buying public know we are ready for them and there you are."

"You will notice that we have a weighing machine on the sidewalk in front of the entrance to our store. You don't have to put a coin in a slot to get weighed, either. All a person has to do is step upon the platform and he knows how much he weighs. This feature was a drawing

Exterior of the Cahn-Forster Store, Showing the Large Window Cards and Weighing Machine.

Views Showing the Neat Arrangement of Stock in the Cahn-Forster Store, Denver.

card from the first, as it caused many people that would have otherwise passed our store to stop and be weighed. It goes further than that, however, for in doing so many times they are attracted to some article in our windows and investigate. This often brings them into the store and thus our sales are materially increased.

"We have gone the weighing business one better, however, by introducing a new feature of our own. We have added to the scale properly ruled cards on which those using the machine can record their weight and the date. Of course, it is needless to say that the card also carries our name and address, and when they are taken away the people are taking reminders of our firm and what we handle. Then when they are in the market for anything in our line they are more apt to come to our store.

"So much for the pedestrians who pass our store. To attract the attention of those passing in the street cars, automobiles, etc., we are in the habit of painting on the window pane a likeness of some article we have on sale in the store, with a catchy phrase added to it. Seeing this the people learn about us, and business comes as a result. We aim to change this way of advertising every week or so. Of course at night when the store is lighted this feature is noticed even more."

Since the Cahn-Forster store is on a corner where there is a great deal of traffic of all kinds the forms of advertising mentioned above are bound to be noticed by many people each day and a great deal of advertising results.

The store also does a good deal of advertising by giving away useful souvenirs—such as rulers with the firm's name on them, and the like. They say that this is another business-getter that brings trade and helps the business to run smoothly. Of course, the Cahn-Forster people also use the ordinary channels of advertising, such as the newspapers, in aiding to keep their business running evenly.

When asked what he thought of special sales Mr. Cahn answered: "It is not our policy to conduct special sales very often, and when we do it is only on the goods we have in stock that are likely to go out of style. We think it is the best plan to set a price on the stock that will not go out of style and depart very little from that price."

"In summing up, I would say," continued Mr. Cahn, "that to keep a business running smoothly the entire year it keeps a dealer continually on his job and entails a whole lot of careful study and planning, a systemic application of this forethought, and some mighty hard work. We find it pays, however, and we expect to continue our business here with a continual growth from year to year."

Suggesting Electrical Gifts for the June Bride.

The idea of having a "June bride" window display is old with the electrical merchandiser. But there is room for a world of originality in "putting across" that same message to the passersby. The accompanying illustration shows a display exhibited by the Commonwealth Edison Company's Electric Shop, Chicago, Ill., in one of its Clark Street windows. The most noticeable feature of the display was its elaborateness. After drawing people, the power of suggesting gifts for the June bride was thoroughly effective.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to 300 words. Payment will be made for all answers published.

Questions.

No. 351.—Annunciator Trouble.—I have some trouble with an automatic set-back annunciator system in a fine residence. It has a ground, but I do not want to take up any floors or tear into walls to find it. Could someone suggest a simple way to locate this ground and some way to overcome the trouble? There are steam pipes and gas pipes in the house.—R. L. G., Reynolda, N. C.

No. 352.—Electrogalvanizing Equipment.—What apparatus is required for an electrogalvanizing plant? Briefly, what are the various treatments to which the material is subjected?—F. W. S., Chicago, Ill.

No. 353.—Motor Wiring in Forge Shop.—In a large forge shop there are to be installed numerous 440-volt, 25-cycle, three-phase motors for driving drop hammers, upsetters, shears and trimming presses, the equipment comprising the following motors: one each of 2, 3, 10, 35 and 75 horsepower, two of 50 horsepower, three of 25 horsepower, and four of 20 horsepower. (a) What is the best type of motor and starting equipment to use in this case? (b) What size wire should be used for the main line? (c) Which would be best, a main line run through the center of the shop with outlet boxes for branch circuits to the motors, or a distributing panel with an individual branch to each motor?—R. B., Jackson, Mich.

Answers.

No. 344.—Life of Gas-Filled Lamps at Various Voltages.—What is the rated life of 110-volt Mazda "C" lamps at rated voltage and at voltages two per cent above and below rated voltage? If available, kindly give data on the life at various voltages ranging both ways from 110 volts up to eight per cent.—R. D., Washington, D. C.

The type "C" Mazda lamps, like other types, are rated to reach 80 per cent of the original candlepower after burning for 1,000 hours. The variation of life with applied voltage is different for the different sizes of lamps and no general answer can be given to the second part of this question.—C. W. B., Harrison, N. J.

No. 348.—Electric Japanning Oven.—In an electrically heated japanning oven what kind of heating units is it best to use? How much wattage should be supplied to an oven of small size? What kind of thermometer should be used to check the temperature?—J. S. C., Fort Wayne, Ind.

Since the enormous growth of the automobile industry there has been a demand for an oven capable of japanning vast quantities of small individual pieces, and because of the flexibility of electricity as regards ease of control the electric oven has now been developed to a high degree of perfection. Electric ovens, as differentiated from furnaces, are now available whether for japanning or other purposes in capacities from a few kilowatts up to 250 kilowatts. The voltage at which these ovens are supposed to be operated is largely a matter of choice, and it is a comparatively simple and inexpensive matter to change the heating unit where a change of voltage is desired. The voltage of standard apparatus is largely a matter of size of oven, the lower voltage being customary for small sizes of ovens, and 220 and 440 volts for the largest sizes. The manufacturers of ovens carry their product for the various standard commercial voltages. The voltage matters little, so long as it conforms to that of the supply circuit, except in the really small ovens, and here 110 volts is preferable to the higher voltages in many cases because the heating unit is more rugged and less easily damaged when designed for 110 volts than for higher voltages.

In japanning ovens the heating unit is composed of some form of resistance material capable of being heated and cooled repeatedly without weakening or oxidizing. The various manufacturers have their own favorite metal for this purpose. Wire-wound heating units are better than carbon because of the absence of all the objections that apply to carbon.

The range of temperatures employed in japanning varies around 500 degrees Fahrenheit. At this temperature the wire-wound resistance units are quite satisfactory, and the measurement of temperature gives rise to no difficulties. Any of the various pyrometers, thermocouples, etc., may be used—each manufacturer of an oven has his own ideas on this subject—and they may be adapted merely for indicating the temperature or may be made to maintain the temperature within definite limits automatically.

The General Electric Company has built for its own use some large electrically operated japanning ovens that are particularly interesting. Each oven consists of a brick incasement inside of which revolves a turntable. The turntable carries a steel cylinder about 10 feet in diameter and 9 feet high which is divided into two compartments. The heating units or resistances are installed between the steel cylinder and the brick casing. Openings are built into both cylinder and casing to permit filling the cylinder with the material to be japanned. The two compartments may be filled together or independently of one another and similarly heated. The temperature of the oven is controlled automatically within the desired limits by thermostats. Each oven is equipped with an indicating pyrometer or temperature indicator, also a clock that may be used as a time switch, when desired, for cutting on or off the current at any predetermined time.

There are many ovens of several different makes in operation for japanning and ranging from 50 to 250 kilowatts. One large central-station company has a load of 20,000 kilowatts of japanning ovens alone on its system. The large manufacturers of electrical apparatus make or sell japanning ovens and to these the querist had better apply for complete information. The success of japanning depends in no small measure upon the choice of the proper size of oven for the class of work it is to be called upon to do.—K. R., Chicago, Ill.

No. 349.—Rate Regulation in Michigan.—Is there in force in the State of Michigan a law or other regulatory measure which governs the rate which may be charged by electrical service companies for electric service?—F. A. B., St. Joseph, Mich.

There is no state law in Michigan that regulates the rates charged by electric service companies. There are local regulations, which consist of stipulations embodied in franchises granted to electric service companies, and which in a measure regulate rates to be charged in such districts or towns.

The Michigan Railroad Commission at Lansing, Mich., acts as arbiter in cases of dispute arising between the public and public service companies, and in all cases involving matters of rates charged for service would have the final decision between the public and the company; such decision, of course, would be subject to review and change by the courts.—W. A. G., Detroit, Mich.

No. 350.—Power Supply for Traveling Crane.—In the case of traveling cranes where either direct current or alternating can be purchased, which kind of power supply would be better adapted for the purpose?—C. J. E., Toledo, O.

Where both direct and alternating current are available the choice in the average case would be direct current. The direct-current motor is well adapted for the work, the control is simple, dynamic braking can be taken advantage of, the number of conductors or trolleys is a minimum, and the flexibility of speed control a maximum.

For direct current, the choice of motor rests with the compound wound and the series types, the latter being used in the

majority of instances. For alternating current, the three-phase induction motor, and the series single-phase motor are available. This latter is not used in this country to any great extent for hoist work, but is finding increasing use in Europe. Of the induction motors, the squirrel-cage type cannot be used because of its unsuitable starting characteristics, and there remains therefore only the wound rotor or variable-resistance type, and the series motor.

Traveling cranes are usually furnished with three or more motors, one for operating the hoist, one for propelling the hoist to and fro along the bridge and the third for propelling the crane along the track, hence it may be realized that simplicity of wiring and control is highly desirable. Herein the direct current has the advantage. The series direct-current motor has the ideal characteristics for hoist work. It has high starting torque, which is necessary for getting heavy loads under way quickly. On light loads the motor speeds up rapidly, thus permitting the crane or hoist to make quick transition from place to place. Not only is the direct-current series motor easily controlled for starting, but dynamic braking can be taken advantage of. Dynamic braking of the three-phase induction motor requires either reversal of one phase or the use of direct current simply for braking. The former causes heavy draughts of current from the line so that as much or more energy is required for braking as for hoisting, and is objectionable; the latter requires a source of direct current, which is hardly warranted in the majority of cases.

The direct-current motor requires but two conductors, or only one if one side of the line is grounded, as is often the case. The three-phase motor requires three wires, and the series type of alternating-current motor either one or two, depending upon whether one side of the circuit is grounded. In this respect there is no choice between the series motor for alternating or direct current. The operating characteristics are, however, in favor of the direct-current motor, for these reasons. In the series motor the field flux is proportional to the current, neglecting saturation, therefore, it may be said that the starting torque is proportional to the square of the current. In the direct-current motor the starting current, before the armature rotates and generates a counter electromotive force, is limited by the voltage drop in the various parts of the machine (the armature, series field, brushes, etc.) and is entirely ohmic or resistance drop. In the alternating-current motor, however, in addition to the resistance drops there are drops due to reactance, reaction of the current in the armature coils short-circuited by the brushes, and time-phase displacement between the current and flux on account of eddy currents and hysteresis. From this it follows that the starting current for a given terminal voltage will be less for the alternating-current series motor than for the direct-current type, and the starting torque will likewise be reduced as the square of the starting current.—K. R., Chicago, Ill.

Where there is a choice of direct current or alternating current as a power supply for an electric traveling crane, the former must be regarded as pre-eminently superior for this duty, for the following reasons: Direct-current apparatus has been more highly developed and better standardized; the electrical equipment as a whole is much simpler; for a given installation the first cost will average a saving of greater than 10 per cent, while on the electrical equipment alone it will average often greater than 25 per cent. In large alternating-current installations the first cost of control devices will sometimes amount to three times that of corresponding direct-current control. Alternating-current braking equipment is more costly to build; its efficiency is lower, and cost of operation and maintenance considerably higher than that of direct current. In hoisting duty the nature of the load demands heavy torque, and the series direct-current motor produces the most powerful starting torque of any electric motor. The corresponding alternating-current motor is of the wound-rotor type. This also has a high starting torque, but is secured at the expense of high current value and limited thereby. A characteristic of the wound rotor is its tendency to "lay down" or "stall" on overload or with a definite value of rotor resistance. This feature is generally considered a disadvantage, inasmuch as it limits its capacity to this breakdown point, which is not the case with the direct-current series motor, which may be worked with any definite value of armature resistance, or, in emergency, considerably beyond its full-load capacity.—M. K., Clifton, N. J.

Three years ago this question would have been answered very quickly in favor of direct current, but there has been such a development in alternating-current apparatus as applied to traveling cranes that it depends entirely on the class of work the crane is going to do as to whether to use alternating current or direct current. Alternating-current cranes usually have constant speed at all loads; however, if the starting resistance is properly proportioned and designed to suit each different design of crane, very good speed regulation between just moving the mechanism and going full speed can be obtained. Alternating-current cranes are usually designed to carry 25 per cent overload and the motors will not pull any more. In some shops this is a disadvantage, in others an advantage, depending on the class of labor operating the crane and the frequency of the overloads. If the overloads are frequent, it is better to get a bigger crane, but an occasional 100 per cent overload will never hurt any well designed crane. The larger number of trolley wires and collectors are another disadvantage as these are about the most troublesome parts of a crane. Up-to-date buyers are now specifying iron bars instead of trolley wire to get over this trouble. Dynamic braking on alternating-current cranes cannot be used except in cases where no lowering regulation is necessary. This means that mechanical load brakes must be used, another very common cause of trouble. The alternating-current magnet brake is not so rugged as the direct-current one and, if not kept very closely adjusted, will give trouble from burned-out coils. Alternating-current motors are simpler and much less likely to give trouble than direct-current machines owing to the elimination of the commutator and brushes.

Direct-current cranes have the following good and bad points: Dynamic braking can be used, cutting out the additional complication of the mechanical load brake and making a simpler trolley. The speed varies inversely with the load, making a crane which will do about 25 per cent more work for the same nominal speeds and easing the load on the power plant. It has a very simple solenoid brake, which very rarely gives any coil trouble. It will pull practically any load you may put it to, making it very easy to overload the crane. The motors are very likely to give trouble with the commutator and brushes. Dynamic braking takes very heavy rushes of current when lowering. Voltage variation does not heat up the motors and coils and this does not vary hoisting power of the crane.

For foundry work, direct-current cranes should be used exclusively owing to their greatly superior speed regulation and their more rugged electrical construction. For most other classes of work the advantages are about equal, the deciding point being the first cost and the difference in the cost of power.—W. L. L., Milwaukee, Wis.

English Electric Vehicle Report.—The annual report of the British Electric Vehicle Committee contained little information of interest beyond that given here periodically as the proceedings of the 12 months have been announced. The committee has been in communication with representative electrical engineers in the British Colonies with a view to the British Electric Vehicle Standards being adopted throughout the British Empire. It is estimated that the number of electric vehicles in use in the United Kingdom is now about 680, an increase of 197 for the year. Of these 48 are electric trucks "the use of which is likely to considerably extend in the near future." Thirty-three municipalities operate between them, or have on order, 78 vehicles.

NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Swartz Electric Lighting Plant.

The Swartz Electric Company, of Speedway, Ind., located just outside of Indianapolis, is placing on the market a lighting plant which is the result of several years of experimentation. It is unique in that it requires no care or attention from the owner and operates automatically, making it specially adaptable for the farm or other isolated use where skilled attention cannot be given.

The plant is 29.5 inches high, 28 inches long, and weighs 365 pounds with the battery. All parts are constructed of the highest grade material and are so built as to insure a maximum of efficiency and service. These sets are made in one-kilowatt sizes at present, and within 90 days will also be made in 3.5 and 7-kilowatt sizes. Edison storage batteries are used.

An electromagnetic governor, free of links, gears, and belts, furnishes perfect regulation for any number of lights within the capacity of the plant, and insures uniform voltage from no load to full load. The operation is made extremely simple by the elimination of rheostat, ammeter, voltmeter, switchboard and the rather intricate wiring that goes to make up the usual switchboard equipment.

Under ordinary conditions current is supplied from the storage battery, up to 15 per cent of the capacity of the plant. Above this the engine automatically starts up, recharges the battery and furnishes the current. Below this 15 per cent the plant again shuts down. The reason this plant is exceptionally efficient is that as soon as the point is reached at which the engine can economically operate, the storage battery no longer furnishes the current. Below this point the storage battery reserve is used.

The entire finish of the plant is oxidized copper, except the flywheel, carburetor, and main controller switch, which are nickel-plated. The greatest accuracy is provided, all work being guaranteed within five thousandths of an inch. The bearings are S.K.F double ball race of the extra heavy type. The winding of all coils is obtained through automatic machines so as to afford the cheapest method of manufacture with the greatest accuracy and reliability. Less than one-tenth of an ounce variation exists between two sets of 25 coils, thus affording perfect running balance of the armature. The same care is used in all parts of the equipment. The running parts are perfectly balanced before assembling, thus insuring freedom from vibration.

The Anderson-Elcon Inclosed Fused Switch.

The new Anderson-Elcon switch is an inclosed fused switch, so constructed that when it is opened the fuse terminals are disconnected from the live metal parts and are exposed in such a way as to render them most accessible for examination or replacement.

In handling fuses on circuits of voltages higher than 110, it is very desirable that the circuits containing the fuses be killed prior to such handling. On 250-volt circuits this result is often obtained by attaching the fuses to the cover of the fuse box in such a way that they are automatically pulled from the fuse clips when the box is opened. This is not possible on high-voltage circuits, owing to the fact that a quick break of some nature must be provided, if, as is often the case, a flow of current is to be ruptured prior to the handling of the fuses.

The Anderson-Elcon switch is so constructed that upon opening the box the current flowing is ruptured by suitable quick-break switch blades, and when the box is open the fuses are exposed to view on the cover and are disconnected from all live wires so that they may be handled without danger of touching any live parts.

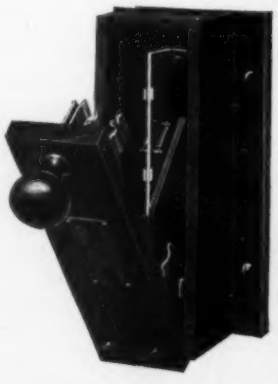
The action of the quick-break switch blades is positive and reliable and, as the fuse clips are not connected with the circuits when the switch box is open, the fuses may be examined or replaced by a workman inexperienced in the handling of electric circuits.

Owing to the danger of a high-potential direct current jumping to metal parts of switch boxes, when such parts are used, the boxes of the Anderson-Elcon switches are made entirely of insulating material. Aside from such fastening screws, clips, and hinges, as are absolutely essential, no material is used except the best quality of impregnated asbestos lumber, fiber, and alberene stone.

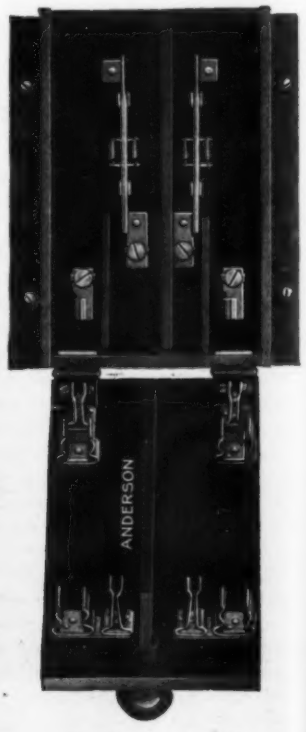
By suitably proportioning the parts made of the above materials the Anderson-Elcon switch box combines the ruggedness necessary to withstand the rough handling usually met with in the use of switches of this nature together with perfect protection against the possibility of short-circuits or grounding caused by use of metal boxes.

These switches are made in both single and double-pole units for 600 volts, 1,200 volts, and 2,400 volts direct current. The single-pole switch is used principally on grounded circuits.

While the switches were designed primarily for controlling air-compressor motors for electric surface cars, the features enumerated in the foregoing adapt them to general use where fused switches are desired on high-voltage direct-current circuits. They are manufactured by the Albert & J. M. Anderson Manufacturing Company, Boston, Mass.



Single-Pole Switch.



Double-Pole Switch.

Sectional Steel Service Buildings for Electrical Companies.

In the construction of electric railways, power and telephone lines, etc., there is always need for a number of service buildings in the construction camp, these being used for the office of the superintendent in charge, as storehouses for various materials, and as sleeping quarters or bunk houses for the construction crew. The former custom of building these out of wood has had many disadvantages, among the more serious ones being liability to destruction by fire and (in the case of men's quarters) insanitary conditions. To overcome these difficulties there has been developed a system of sectional steel buildings that are made in a great variety of sizes and types to suit different requirements. These structures are easily put up, dismantled, moved and reconstructed. They are absolutely fireproof and, being made of a double wall with heat insulation and air spaces, they remain warm in winter and relatively cool in summer.

The material used is galvanized steel No. 24 gauge for the walls and roof, the latter being usually corrugated. These sheets are cold-rolled and heavily galvanized so as to make them strong and durable. The side walls may be crimped and stamped into various patterns to increase both the strength and attractiveness of the structure. Where required, these walls are reinforced with either No. 18 or No. 20 gauge steel. Angle irons and steel rods are used for strengthening and holding the structure together. As a rule, these structures are made in two-foot sections, which permits adapting the size of the building to actual requirements. Contraction and expansion are taken care of in tubular joints, as well as in the double studding. Patented interlocking joints as well as the general system of construction prevent the building from rattling, and the entire structure is rigid and very strong in comparison with its light weight.

The building of such structures was begun in St. Paul, Minn., about 15 years ago after a large number of experiments in constructing sectional metal buildings had been carried out. This system of steel buildings, which has been perfected by the Metal Shelter Company of America, New York, N. Y., has now been in continuous use without alteration for these 15 years. Practically all details of the construction are patented.

These buildings are in use by electric and steam railroads, telephone, electric light and power companies for construction purposes, as garages and for a great many other purposes. In Fig. 1 is shown a typical workmen's bunk house, which in this case measures 12 by 24 feet, and has eight-foot side walls. The attractiveness of this structure in comparison with the usual workmen's quarters in construction camps is very evident. This building is not only fireproof but entirely proof against germs and vermin, which so readily infest wooden buildings used for this purpose. It is provided with folding bunks, which can be turned against the walls during the day to permit using the entire floor space as a dining room, storeroom, shelter, etc. In Fig. 2 is shown the interior of a district supply station used by a telephone company for keeping

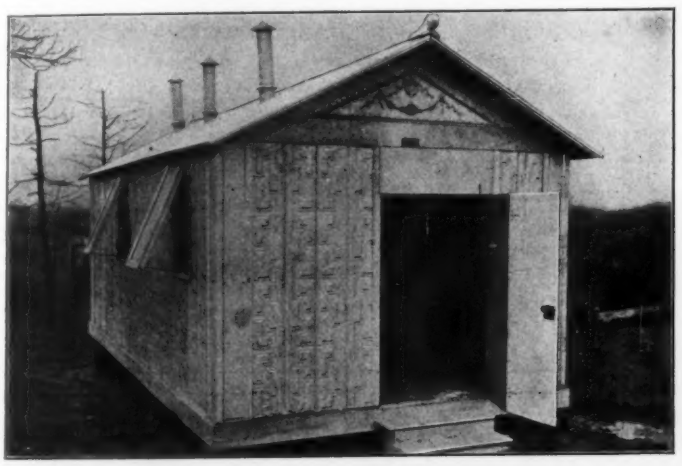


Fig. 1.—Sectional Steel Bunk House for Construction Crew.

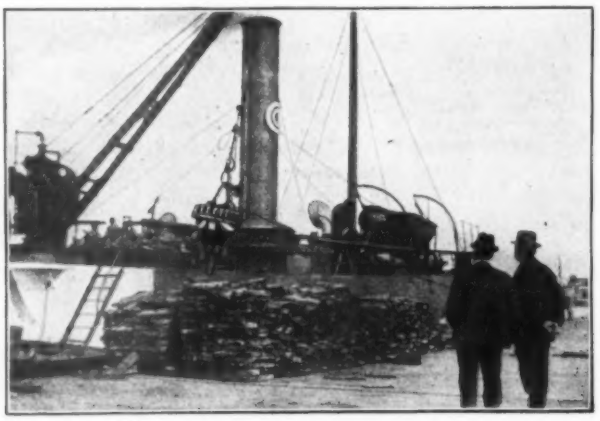
Fig. 2.—Sectional Steel Building Used as a District Supply Station by a Telephone Company.

Fig. 3.—Outdoor Substation With Sectional Steel Building Housing Secondary Apparatus.

a stock of construction supplies. In this case wooden shelving is used, but the building can be provided with metal shelving, steel lockers, bins, etc., so as to make the complete outfit fireproof. Fig. 3 shows a small steel building for housing the secondary switches, meters, etc., of an outdoor steel-tower substation. A large number of these are now being installed along power transmission lines and are giving complete satisfaction. On account of their fireproof nature they are greatly superior to any wooden shack that might be used for this purpose. The equipment for the substation shown was provided by the Delta-Star Electric Company, Chicago, Ill.

Lake Vessel Carries Its Own Lifting Magnets for Loading Pig Iron.

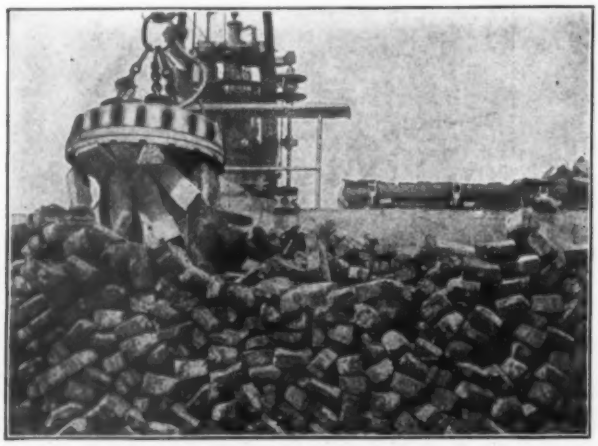
As long ago as 1910 two lifting magnets were installed on the dock at the Inland Steel Company, Indiana Harbor, Ind., and made a record of unloading 4,000,000 pounds of pig iron from the Gilchrist freighter *Erwin L. Fisher* in 10.5 hours.



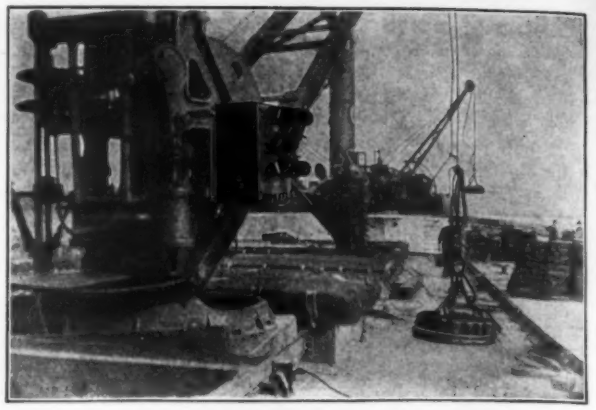
Lifting Magnet on Vessel Loading Pig Iron.

Since then many of the same kind of magnets have been made part of dock equipments.

The first ship to carry its own equipment of magnets for loading purposes is the freighter *Cicoa*, belonging to the Charcoal Iron Company of America. The first load taken on board by the new method was at the Ashland, Wis., docks of this company and, according to Captain James H. Gallagher, the services of a gang of longshoremen were dispensed with and the entire cost of putting on the cargo of 4,000,000 pounds (2,000 tons) was only $100. The cost of loading with longshoremen would have been from $500 to $600, thus making a saving of from $400 to $500 every time the vessel is loaded. Three 36-inch C-H circular magnets are installed, with one man for each magnet and one attendant for the generator which furnishes current tor the magnets.



Near View of the Magnet.

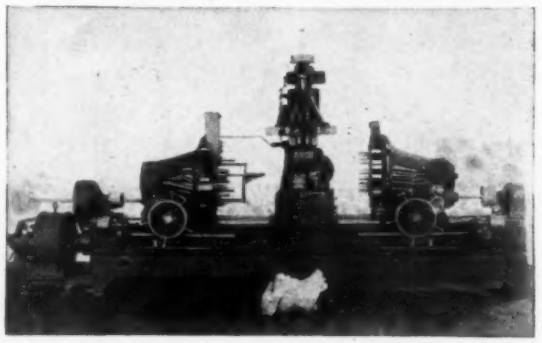


Near View of the Magnet Control Gear.

With all three magnets working the net weight of pig iron lifted from the dock is 4,500 pounds. The *Cicoa* will be employed exclusively in carrying pig iron from the company's docks at Ashland, Manistique, Boyne City, and Newberry, Mich., to Buffalo, N. Y. The Cutler-Hammer Clutch Company, Milwaukee, Wis., furnished all the magnets referred to.

Motor-Driven Multiple-Spindle Drilling Machine.

For drilling all the holes in an automobile transmission case at one setting the Baush Machine Tool Company, Springfield, Mass., has perfected the multiple-spindle drilling machine shown in the accompanying illustration. This machine is unique in that there are 46 holes in each transmission case and the drilling is done regardless of the fact that some of the holes are on an angle and vary in size from $\frac{7}{16}$ to $1\frac{1}{16}$ inch. Each drill runs at the same speed and each group of drills has independent feed.



Multiple-Spindle Drilling Machine That Drills 46 Holes at One Setting.

The machine is operated by a 25-horsepower, 230-volt, commutating-pole, direct-current, Westinghouse motor, through a main driving shaft placed at the rear of the machine, connected to the horizontal heads by steel gears and cloth pinions, and connected to the vertical head by bevel gears. The motor operates equally as well in either direction of rotation and can be reversed without changing the position of the brushes.

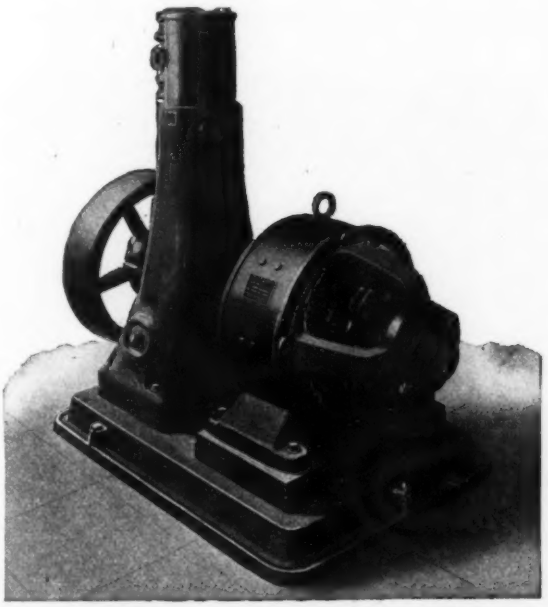
The bed of the machine is supported on feet, providing ample space for cleaning under the machine and preventing the floor from becoming water-soaked if drilling compound is used. All reciprocating parts are inclosed in cast guards, effectually protecting the operator from injury. Various spindle speeds are obtained through gear reductions incased in oil-tight boxes on the heads. The

spindles are equipped with ball thrust bearings and Baush universal ball joints. An improved type of arm allows a center distance between holes equal to the diameter of spindle. Spindles may be adjusted for different lengths of drills by operating but one screw at the outer end of arm. The horizontal heads have standard belt-driven feed with automatic control and quick traverse by handwheel. Vertical head and cluster box slides are automatically controlled by left-hand head through trip rod and bell crank which operate the jaw clutch on reversing gears in gear box. These gears control the shaft operating the pinion and racks attached to the vertical head and slide.

In operation the left-hand head is brought forward, automatically engaging the feed of the vertical head and cluster-box slide, which travel the required distance and automatically return to neutral position. The feed for the right and left-hand heads is now engaged by levers. At the same time a spindle on the box jig drills the hole. The feed is automatically tripped by stops and the heads return to neutral position, completing the operation.

Westinghouse-American Blower Direct-Current Generator Set.

The generating set illustrated is for marine or stationary service and is especially adapted for lighting or power service in small plants, and for exciters for large alternating-current generators in power stations. It consists of an



Generator Set Composed of American Blower Engine Direct-Connected to Westinghouse Generator.

American Blower Company single or double-cylinder, automatic steam engine, and a direct-connected type SK direct-current generator made by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. For lighting or power service the standard voltages are 125 and 250 volts. For this service generators are furnished having compound field windings to give the same voltage at full load and no load. For special systems where 125 volts are required for lighting and 250 volts for power, the larger-sized generators are supplied for three-wire service. These three-wire generators will take care of any unbalancing of the two sides of the system up to about 10 per cent of full load.

The set is simple to operate and requires little attention. Even the oiling system is such that replenishing of the lubricant is necessary only infrequently. The generator is of forged open-hearth steel frame construction with commutating poles and large non-leakable bearings protected from dust. It has automatic oil-ring lubrication, fixed brush position, is compact, strong and light in weight, has low operating temperature, and requires no skilled attention.

The generator is mounted on the same base with the engine, to which is is direct-connected. The bearings, brushes and commutator are the only wearing parts and these are so designed that the wear is reduced to a minimum. The engine is very quiet in operation and has automatic lubrication by pump and gravity, with large oil cooling, settling and filtering area. All wearing parts are easily adjustable, and perfect speed regulation is obtained.

This set is also well suited for use in isolated factories, stores, warehouses, mines, aboard ships, passenger steamers, yachts and dredges, as well as for driving blowers, operating bucket elevators, screw conveyors, chain drags, hoisting apparatus, cylinder driers, centrifugal driers and laundry machinery.

Compactness, light weight, economy of operation, simplicity, freedom from noise and vibration at high speed and reliability under the most severe conditions are features that make it especially desirable for service where it is not possible to give it much attention.

High-Speed Steel Alloy Without Tungsten.

In the manufacture of high-speed steel and turning, planing, and slotting tools made from this material, six processes must now be employed before the finished article can be produced. These processes are: casting the material into ingots; reheating the ingots and forging into cogged bars; reheating again and finishing the bars by rolling or forging to final sizes; annealing finished bars; forging or grinding tools to shape; hardening and then grinding and finishing.

The proprietor of several steel concerns in Sheffield, England, has taken out British patents for a new process covering the manufacture of a new high-speed steel alloy, and claims superiority over the old process in several important respects.

In manufacturing high-speed steel under the former process an indispensable alloy has been tungsten, which in normal times is used to the extent of 14 to 24 per cent. In the new process no tungsten, molybdenum, cobalt or vanadium is used, and it is stated that the required ingredients are freely obtainable wherever steel is manufactured. Considering the present scarcity and abnormal price of tungsten, especially in neutral countries, this feature of the discovery is claimed to be of supreme importance. Another claim, and also one on which great stress is laid, is the low cost of manufacture. The tools are simply cast into the proper lengths, after which the cutting edge is shaped and sharpened on an emery wheel. The tool is then ready for working. Four of the six ordinary processes are eliminated. A third claim is that when the tools become too worn for further working, the parts remaining can be remelted and no loss results.

Tools made in the manner stated have been tested as against high-speed tools of established makes, and in each case the result was quite satisfactory. The new process is suitable only for turning, planing, and slotting tools, all of which can be made by casting, and is not suitable for twist drills or milling cutters. It is stated, however, that the consumption of high-speed steel in the manufacture of tools for which the new discovery is available represents probably 75 per cent of the entire consumption of steel for machine tools.

Patents in the United States and other countries are being applied for, and it is proposed in the near future to place the process before steel makers in the United States.

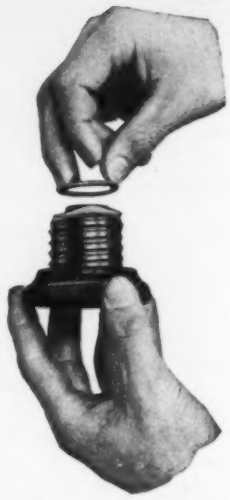
Regent Film Sockets for Series Street Lamps.

The simplest form of automatic cutout for series incandescent lamps is the film socket, which is a socket provided with means for inserting between a special set of its terminals a film of dielectric material that is capable of withstanding the ordinary voltage impressed upon the lamp terminals, but which will be punctured when the lamp filament breaks and thus causes a momentary increase of voltage across the film.

From this brief statement of the action of a film socket it is evident that reliability is its most important requirement. If it punctured below normal lamp voltage, it would cut out lamps still in serviceable condition. If it did not puncture until a very great excess over normal voltage occurred, it would necessitate the building up of very high voltage in the open-circuited line before it would act and then the sudden breakdown of the film would cause violent surges before normal conditions were restored, such surges as are destructive, particularly to the gas-filled tungsten lamps now so generally used for street lighting. Again, if it did not puncture at all, it would be valueless because the line current would not be restored. Of these three conditions the second and third have been found particularly common and annoying heretofore, for which reason the film socket has been in rather bad repute among many lighting engineers.

It is pleasant to record, therefore, that an improved film socket is now on the market which, according to prolonged tests recently concluded, has been shown to have exceptionally high reliability. This is the Regent film socket manufactured by the George Cutter Company, South Bend, Ind. The general construction of this socket, which is thoroughly well built in all details, was described in these columns in the issue of February 20, 1915. Since that time the dielectric film has been further standardized and in recent tests made by the Electrical Testing Laboratories, New York City, proven to give a very uniform and entirely reliable performance.

Regent Film Socket With Film Holder Unscrewed.



Replacing Film on the Film Holder.

View in Factory of the Dickinson Manufacturing Company.

The development of molded insulating materials has made great headway in recent years, since it was found that insulating compounds could be employed in many cases to give the qualities that porcelain and rubber lacked. Among manufacturers that have specialized in the production of molded insulations is the Dickinson Manufacturing Company, a view in whose factory at Springfield, Mass., is shown above. This company has increased its business greatly during the last three years and particularly during last year, although no war materials are made. The compounds made by the company are particularly suitable where high temperatures are involved. They include Sternoid, Stern-Condensite, rubber substitutes, and several standard and special compounds. These products have been developed by Kurt R. Sternberg, treasurer and general manager of the company, after whom several of them have been named. These materials are being used by the United States Navy, by some of the leading electrical manufacturers and central-station companies, etc. They are also used for non-electrical purposes by makers of phonographs, typewriters, etc.

INDUSTRY ACTIVITIES

Harvey Hubbell, Incorporated, Bridgeport, Conn., has issued sales data memorandum sheets giving revised list prices on Hubbell sockets and pull switches.

James G. Biddle, 1211 Arch Street, Philadelphia, Pa., is mailing a card on bridge-megger testing sets for indicating insulation resistance of covered wires, cables, feeders, dynamos, transformers, etc.; and for locating faults by the varley-loop method.

Usona Manufacturing Company, 1 Hudson Street, New York City, makers of Kwik-lite products, has recently issued three folders for distribution as sales helps to Kwick-lite dealers. The application of flashlights in the home, by automobile owners and by vacationers is attractively pictured.

Roller-Smith Company, manufacturer of electrical instruments and circuit-breakers, 233 Broadway, New York City, has established an agency in St. Louis, Mo. George W. Pieksen, who is located in the Railway Exchange Building, that city, will handle Roller-Smith products in St. Louis and in parts of the states of Missouri and Illinois.

The Pelton Water Wheel Company, of San Francisco and New York City, has issued in conjunction with the **Westinghouse Electric & Manufacturing Company,** East Pittsburgh, Pa., a folder on water-power development. A short outline of the information required for an analysis of a proposed development is given. Applications of power in the home are also illustrated.

Bryant Electric Company, Bridgeport, Conn., is constructing a 60 by 130-foot addition to its plant, and a further extension 50 by 50 feet, the total cost being about $50,000. The main floor of the addition will be completed some time in August and will be equipped with machinery for the manufacture of wiring appliances, the cost of the machines being about $70,000. About 300 hands will be added to the force of employees.

The Electric Storage Battery Company, Philadelphia, Pa., has announced the opening on June 15 of its new offices in Boston, Mass., which were formerly at 60 State Street. The new building is located at 718 Beacon Street, and was designed especially for the requirements of the Electric Storage Battery Company and the Exide Battery Depots, Inc. Every detail of the building has been planned so as to adapt it to storage-battery purposes. It will contain an "Exide" battery service station for the care of batteries for electric-vehicle propulsion and for starting, lighting and ignition on gas cars.

New Boston Office Building and Service Station of The Electric Storage Battery Company.

Hill Pump Company, Anderson, Ind., has issued a folder illustrating the construction and application of the Hill "Electric-Pression" water-supply system for residences not within the zone of city water systems.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is distributing an attractive catalog devoted exclusively to its line of electric ranges and discussing in detail the six exclusive features claimed for the Westinghouse products. The catalog gives complete specifications of all ranges manufactured by this company and also suggests copy for dealer newspaper advertising.

Cameron Machine Company, of Brooklyn, N. Y., has been favored with an order for ten slitting and rewinding machines built on the special patented principles used by that company. It is understood that these machines will be employed in general commercial work in Russia for converting fabrics, paper and other material into strips for a variety of uses in Russian textile and paper trades, also for medical and surgical purposes. The order ran into considerable money and was placed with the Cameron Machine Company only after painstaking investigation by the engineers of M. S. Friede, American purchasing agent for the Russian government.

Marconi International Marine Communication Company, Limited, reports substantial increases in business during 1915, notwithstanding considerably decreased passenger traffic and restrictions in respect to wireless messages at sea. The number of telegraph stations owned and worked by the company as public telegraph stations on the high seas increased by 133 to 1,008, this increase being mainly responsible for the advance of the revenue from ship's telegrams, subsidies, etc., by $165,000 to $1,044,500. The net profit for 1915, after deducting $146,406 for depreciation and debenture interest, is $318,150, compared with $278,340. The International Marine and its associated companies have now a total of 2,300 mercantile vessels fitted with Marconi telegraph stations. The dividend for the year is 12.5 per cent. The Australasian company, in which the International Marine is also interested, has paid 6 per cent.

The Cutter Electrical & Manufacturing Company, Philadelphia, Pa., has issued a book entitled "Typical I-T-E Circuit-Breaker Installations." It is a book of 352 pages, 9 by 11 inches, attractively printed and bound. Nearly every page contains an illustration showing an I-T-E installation. The company has relied upon the illustrations, rather than upon intricate technical descriptions, to suggest the range of its installations, although in the case of certain notable plants such engineering data have been added as will appear of special interest. The large number of users of I-T-E circuit-breakers is suggested by illustrations of installations in the plants of the United States Steel Corporation, Curtis Publishing Company, Chalmers Motor Company, Ford Motor Company, Dodge Brothers, in many of the large office buildings and hotels in this country, in United States Navy yards and battleships, in street-railway and lighting and power plants, and by many other illustrations of typical installations. The book contains very little matter of an advertising nature, though as a whole it is a very good advertisement of the popularity of the company's products and the reason therefor.

LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

ATTACHMENT PLUGS, Fuseless.—Harvey Hubbell, Incorporated, Bridgeport, Conn.

Separable attachment plugs, having porcelain or composition bases or caps, 660 watts, 250 volts, catalog Nos. 5491, 5493, 5607, 5612, 5701, 5817, 5914, 5917, 5927.

Cord connectors, 10 amperes, 250 volts, catalog Nos. 6085-86, 6095, 6407.

Weatherproof, 10 amperes, 250 volts, catalog Nos. 6293-94.

Caps, catalog Nos. 5700, 6336.

Listed June 9, 1916.

CABINETS AND CUTOUT BOXES, Sheet-Metal.—Fish & Horton Company, 123 Mill Street, Rochester, N. Y.

Junction boxes provided with covers secured by machine screws. "F. & H."

Listed May 15, 1916.

FIXTURES FOR USE WITH GAS-FILLED LAMPS.—Bel-Ko-Lite Company, 416 South Dearborn Street, Chicago, Ill.

Catalog Nos. 1014, 1217.

Listed June 13, 1916.

OPTICAL INSTRUMENTS, Test Chart Cabinet.—F. A. Hardy & Company, 10 South Wabash Avenue, Chicago, Ill.

An electrically illuminated, translucent chart having lamps in several compartments individually controlled from a remote point by selector switch connected to cabinet by special multiple cable. Catalog No. 1052.

Listed June 13, 1916.

RECEPTACLES, For Attachment Plugs.—General Electric Company, Schenectady, N. Y.

Surface receptacles. 25 amperes, 250 volts, catalog Nos. 45395, 45490, 59194; with sub-base, 59199. 50 amperes, 125 volts, catalog No. 167536, for use in charging batteries on electrical vehicles.

Listed June 5, 1916.

RECEPTACLES, Standard.—General Electric Company, Schenectady, N. Y.

"G. E." porcelain shell. Keyless, 1,500 watts, 600 volts, catalog No. 159380.

Listed May 27, 1916.

ROSETTES, Fuseless.—Weber Electric Company, Schenectady, N. Y.

Fixture, 3 amperes, 250 volts, catalog Nos. PG301-04, PG309-10, UG101-03, UG105-09, UG111-15.

Listed June 2, 1916.

SIGN MACHINES.—Thomas Cusack Company, Chicago, Ill.

Motor-operated sign flasher machines of revolving-drum and brush-contact type. 15 amperes or less, per switch. 125 volts or 125-250 volts.

Listed May 11, 1916.

SIGNS, Electric.—C. H. Lush Sign Works, Merrick Road, Freeport, L. I.

Electric signs shown by tests and examinations to be in accordance with the requirements of the National Board of Fire Underwriters have labels attached.

Listed May 29, 1916.

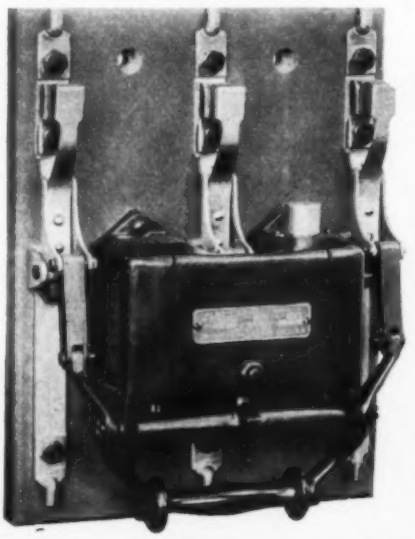
SIGNS, Electric.—F. E. Hayes Company, Rochester, N. Y.

Electric signs shown by tests and examinations to be in accordance with the requirements of the National Board of Fire Underwriters have labels attached.

Listed May 29, 1916.

SWITCHES, Automatic.—General Electric Company, Schnectady, N. Y.

G. E remote-control switch, 100 amperes, 250 volts; type R, form C-2, designed for panelboard mounting and operated by two solenoids. Switch may be opened or closed manually or by momentary contact switches, catalog No. GE-154, located at remote points.



Automatic Switch.—General Electric Company.

Note.—Control circuits should be installed in accordance with Class C requirements of the National Electrical Code.

Listed April 12, 1916.

SWITCHES, Combination Cutout.—H. T. Paiste Company, Thirty-second and Arch Streets, Philadelphia, Pa.

Porcelain-base knife switches and plug fuse cutouts. 30 amperes, 125 volts, two and three-pole, catalog Nos. 4023, 4029.

Listed June 5, 1916.

SWITCHES, Fixture.—Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins," 3 amperes, 125 volts; 1 ampere, 250 volts. Candle, key, catalog No. WT-92. Candle, pull, catalog No. WT-94. Candle, turn, catalog No. WT-93.

Listed June 9, 1916.

SWITCHES, Fixture.—Pass & Seymour, Incorporated, Solvay, N. Y.

Fixture switches with pull-chain mechanisms. "P. & S." Single-pole, 3 amperes, 125 volts; 1 ampere, 250 volts; catalog Nos. 725-27, 729.

Listed May 27, 1916.

SWITCHES, Pendent Snap.—Pass & Seymour, Incorporated, Solvay, N. Y.

Switches with pull-chain mechanisms, "P. & S." 3 amperes, 125 volts; 1 ampere, 250 volts; catalog No. 728.

Listed May 27, 1916.

SWITCHES, Surface Snap.—The Hart & Hegeman Manufacturing Company, 342 Capitol Avenue, Hartford, Conn.

Double-pole, catalog No. 3460.

Listed June 9, 1916.

SWITCHES, Surface Snap.—Pass & Seymour, Incorporated, Solvay, N. Y.

Switches with pull-chain mechanisms.

P. & S. single pole; 3 amperes, 125 volts; 1 ampere, 250 volts; catalog Nos. 3008-19.

Listed May 27, 1916.

WIRE, Rubber-Covered.—Eugene F. Phillips Electrical Works, Limited, Montreal, Que.

Marking: Two white threads parallel with conductor, between rubber insulation and braid.

Listed June 6, 1916.

WIRES, Fixture.—Alfred F. Moore, 200 North Third Street, Philadelphia, Pa.

Stranded conductors, No. 18 B. & S. gauge. Two types; first covered with a cotton wrap and a cotton braid impregnated with slow-burning compound and either slicked down or finished with an outer silk or cotton braid; second covered with a cotton wrap and two asbestos wraps impregnated with slow-burning compound and finished with an outer silk or cotton braid. Furnished as single conductor or twisted pair.

Marking: Red, white and blue cotton threads cabled with copper strands.

Listed June 13, 1916.

PERSONAL AND BIOGRAPHICAL

MR. M. E. ARNOLD, who was elected president of the Electrical Contractors' Association of the State of Pennsylvania at its fourth annual meeting in Wilkes-Barre on June 21-22, is head of the firm of M. E. Arnold & Company, electrical contractors, of Philadelphia. After his

M. E. Arnold.

graduation from Girard College, Philadelphia, in 1894, Mr. Arnold secured a position in the Philadelphia office of the General Electric Company, where his work was of a very practical nature. Later he was employed by the Bell Telephone Company and several wiring contractors in the same city. In 1897 he organized the firm of M. Edwin Arnold, which was later changed to M. E. Arnold & Company, although the business is still conducted by Mr. Arnold individually, and has grown steadily year by year. Mr. Arnold has always taken a wide interest in the larger activities connected with the electrical contracting business. He was one of the original members of the National Electrical Contractors' Association, and during 1914 first served as president of the Electrical Contractors' Association of Pennsylvania. He has been president of a local association known as the Philadelphia Electrical Contractors' Association. Mr. Arnold is a prominent Jovian and his firm is a member of the Society for Electrical Development.

MR. C. D. FAWCETT, formerly instructor in the electrical engineering department of the University of Pennsylvania, has been appointed assistant secretary of the Illuminating Engineering Society, to fill the position made vacant by the resignation of MR. JOSEPH LANGAN.

MR. BERT WASLEY, manager of the Albert Sechrist Manufacturing Company, Denver, Colo., and nephew of Albert Sechrist, head of that company, which is one of the leading fixture concerns in the West, was recently married to Miss Gwendolyn Hedgcock, of Denver. Both young people are favorites in Denver society, and were married on Lookout Mountain west of Denver, a typical setting for a Western wedding. They are spending their honeymoon in the East.

MR. H. O. SWOBODA, electrical and mechanical engineer, of Pittsburgh, Pa., has been retained by the Borough of Monaca, Pa., as consulting engineer for the purpose of conducting negotiations with the local lighting company.

MR. R. A. RIDDLE, manager of the Wharton, Tex., plant of the Texas Southern Electric Company, of Victoria, has been transferred to the company's plant in Beeville, where he will be manager in place of MR. F. C. GREER, who was transferred to Mr. Riddle's position in Wharton.

MR. THOMAS CHANDLER, the newly elected president of the Michigan Section of the National Electric Light Association, is vice-president and superintendent of the Edison Sault Electric Company, of Sault Ste. Marie. He was graduated from the University of Michigan in 1910, after which he was appointed superintendent of that company, being advanced to his present position in 1915.

MESSRS. J. B. AMBLER, O. W. OTT and L. J. RITER have formed the firm of Ambler, Ott & Riter, with offices in the Kearns Building, Salt Lake City, Utah. It is the intention of the firm to furnish consulting engineering services on hydraulic, mechanical and electrical installations covering investigation, design, purchasing and installation. They will be equipped to furnish supervision on construction work, and will also engage in the operating management of electrical and mechanical plants for factories, mines, mills, and allied industrial enterprises. A feature of their work will be to act as engineering representatives of Eastern manufacturers, who desire to have supervised the installation and operating of special electrical and mechanical equipment sold throughout their territory. Mr. Ambler was previously connected with the General Electric Company's engineering department, and more recently with the Salt Lake district office as sales engineer. He is a graduate of the University of Pennsylvania in electrical engineering. Mr. Ott was a recent member of the firm of Wilson & Ott, consulting engineers, and before that time was mechanical engineer of the Oregon Short Line Railroad Company. Mr. Ott is a graduate of Sibley College of Cornell University. Mr. Riter has been connected with the engineering departments of the Utah Power & Light Company, Utah Light & Railway Company, Nevada Consolidated Mining Company and other railroad and mining properties, and is also a graduate of Sibley College.

MR. GEORGE B. FOSTER, who was re-elected chairman of the Chicago Electric Vehicle Section, National Electric Light Association, is assistant to the vice-president of the Commonwealth Edison Company. He has been prominent in electric vehicle affairs for the past few years and as a representative of the local central-station company has done much towards promoting co-operation between the various vehicle interests in Chicago. Mr. Foster was chairman, last year, of the Committee on Rates and Garaging of the Electric Vehicle Association of America, and his report presented at the Cleveland convention attracted wide attention.

Mr. R. A. MacGregor, sales manager, Merchants Heat & Light Company, Indianapolis, Ind., distributing packages containing 50 post cards and lead pencils among the soldiers of Battery A, while in camp at Fort Benjamin Harrison. The gifts were made through courtesy of the central station acting upon the suggestion of Mrs. Harrison, wife of the president of the company.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

HOLLIS, N. H.—Articles of corporation of the Hollis Electric Company have been filed. The purpose of the company is to purchase, generate, distribute and sell electricity and to buy or sell at the state line from or to the Shurley Electric Company such electrical energy as may be required by either company. The capital stock is $5,000 and the incorporators are T. E. Whitaker, A. E. Shearer and others.

FALL RIVER, MASS.—The Fall River Electric Light Company is planning a number of extensions to its distribution system.

LONGMEADOW, MASS.—An agreement has been reached wth the United Electric Light Company, of Springfield, Mass., whereby that company will furnish street-lighting service after August 1. The contract provides for 140 lamps of 80-watt capacity.

CANISTEO, N. Y.—The Canisteo Light & Power Company has been organized by C. A. Larrowe, George Whiting and others to furnish electric service here.

PERRYSBURG, N. Y.—After considerable controversy, an agreement has been reached whereby franchises have been given to the Silver Creek Electric Company and to the Gowanda Light & Power Corporation, one of the companies furnish electric service to the town of Perrysburg and the other to the village of Perrysburg.

NEW YORK, N. Y.—The J. G. White Management Corporation, of New York, has been retained as operating managers of the Shore Line Electric Railway System and the Norwich & Westerly Traction Company. The combined property operates 250 miles of interurban electric trolley lines and serves all the towns and shore resorts on Long Island Sound east of New Haven, and continues the service from New London, Conn., through Westerly, R. I., to Watch Hill, Atlantic Beach, Weekapaug, and other records on the Atlantic Ocean. The main line of the system runs from New London north through Norwich, Conn., to Webster Mass., and by connection with other lines reaches Worcester, Mass. In addition, city service is furnished in New London and Norwich, Conn., and several important lines radiate from each of these points.

RANSOMVILLE, N. Y.—The Lewiston & Lake Ontario Shore Power Company is erecting a transmission line from Wilson to this city.

BAYWAY, N. J.—Work has been started on a new substation for the Public Service Corporation to be built in Bayway, near the Long Branch Railroad. This has been made necessary by the great amount of power used by the manufacturing plants in this vicinity, and it is being erected to give better servce.

PENNSGROVE, N. J.—Municipalities in the neighborhood of Atlantic City have organized a committee to arrange for immediate surveys of proposed high-speed electric railway line, with transmission system, from Pennsgrove and vicinity to Atlantic City. Simon Cunningham, mayor of Pennsgrove, is interested.

SHREWSBURY, N. J.—The Monmouth County Electric Company, which went into the hands of a receiver April 19, has been sold at auction to C. A. Potter, Jr., of Philadelphia; F. P. McDermott and A. A. Eldridge, of Jersey City, a bond-holding committee, for $10,000. The company operates an electric line from Long Branch to Rumson. The new owners have not made their plans public.

BEAVER FALLS, PA.—The Comment Light Company of Beaver Falls has been chartered to operate in Moon Township, Beaver County, its capital being $5,000. The incorporators are J. R. McNary and G. H. Pifer, of Pittsburgh; F. S. Miller, of Jeannette, and others.

NEW CASTLE, PA.—Charters have been granted to 12 electric light and power companies to operate in townships near this city. The capitalization of each is $10,000, with the principal offices in New Castle, and E. G. Dunlap is treasurer.

PHILADELPHIA, PA.—The Mifflin Corporation will build a new concrete boiler plant at its chemical works.

WILKES-BARRE, PA.—The City Commissioners are considering specifications for lighting the city streets. The contract expired July 1, but a new contract will not be made for several weeks.

BALTIMORE, MD.—It is reported that the United Railways & Electric Company will construct a substation near its Electric Park carhouse. Two or three 1,500-kilowatt rotary converters will be installed, together with the necessary transformers, switchboards and auxiliary apparatus.

NARROWS, VA.—The Narrows Light & Power Company plans the development of 1,500 to 3,500 horsepower at Narrows Falls on New River. A new power house will be constructed. B. F. Groff, 556 Woolworth Building, Lancaster, Pa., is engineer.

COLUMBIA, S. C.—The Columbia Railway, Gas & Electric Company is planning a number of extensions to its transmission system.

CORDELE, GA.—An election will be held August 3 to vote on the question of issuing $50,000 in bonds to build an electric light and power plant. J. N. King is chairman of the finance committee.

ROME, GA.—The establishment of a municipal elcetric-lighting plant will be one of the important issues at an election to be held soon.

SAVANNAH, GA.—The Council has approved two resolutions proposed by Alderman J. W. Daniel to appoint committees to make investigations looking to the establishment of a municipal electric plant and the building of a belt line railway to furnish Savannah manufacturers with better shipping facilities.

NORTH CENTRAL STATES.

AKRON, O.—The Northern Ohio Traction & Light Company has applied to the Public Service Commission for authority to issue $14,075,000 first-lien refunding gold bonds, of which $12,119,700 is for liquidation of indebtedness and $1,955,300 for improvements. While the larger part of the proceeds will be used for track improvements, $280,000 will be spent to build a high-tension transmission line from the Gorge plant to Canton which will allow the abandonment of the present Canton plant.

COLUMBUS, O.—In order to supply additional electric power to the southeast section of the city it has become necessary for the Columbus Railway, Power & Light Company to build a new transmission line about six miles long. This will extend in Front Street as far south as Ambos, thence along the old canal bed to Frank Road and from there to Smoky Road. The new line will be of both underground and overhead construction. The underground portion will be approximately two miles long. The approximate cost of the entire line is $80,000.

HOOKSTOWN, O.—A charter has been granted to the Hookstown Light Company, incorporated with a capital of $5,000 by J. B. McNary and G. H. Pifer of Pittsburgh, H. H. Montgomery, of Whittacre, and others. It is understood the new company is connected with a corporation now erecting a high-tension transmission line from Rochester to this city to furnish energy for private and municipal use among small towns and rural residences within a small distance of the proposed route.

LONDON, O.—At the special meeting of the City Council it was decided to retain the present electric-lighting plant and to improve it to meet immediate and future demands of the city. In order to do this an issue of $25,000 in bonds probably will be made.

TERRE HAUTE, IND.—The Terre Haute, Indianapolis & Eastern Traction Company is at the present time preparing to install a block signal system on the lines between Terre Haute and Brazil, at an approximate cost of $25,000.

BONDVILLE, ILL.—The Bondville Electric Light Company has been incorporated with a capital of $1,500 by J. C. Flowers, G. B. Talbott and others to furnish electric service here.

MT. STERLING, ILL.—The citizens of Mt. Sterling are planning to build and operate a municipal electric-lighting plant. The estimated cost of a complete new plant is placed at $30,000.

LUDINGTON, MICH.—It is reported that the Commonwealth Power & Light Company plans to purchase the plant of the Stearns Light & Power Company and its franchises to furnish light and power in Ludington, Scottville, Hart, Shelby and Pentwater. Surveyors employed by the Commonwealth company are working between here and Muskegon which has led to rumors that the Commonwealth company is planning an interurban line from Muskegon to Ludington and that the company now has an option on a site for a station here. The Commonwealth company is building a large dam on the Manistee River near Manistee which it is said will develop 20,000 horsepower.

PETERSBURG, MICH.—The Petersburg Electric Light & Power Company has been incorporated with a capital of $5,000 by William Schroeder, William L. McAran and others.

MILWAUKEE, WIS.—The Common Council has recommended the adoption of a resolution to employ an electrical engineer at a cost not to exceed $5,000 to prepare detailed plans and specifications for the municipal electric distribution system.

DAYTON, IOWA.—Bonds in the sum of $15,000 have been voted for the establishment of a municipal electric-lighting system here. A proposition to purchase energy from the Ft. Dodge, Des Moines & Southern Railway Company and construct a high-tension transmission line to the interurban company's station at Harcourt also carried.

DES MOINES, IOWA.—A $50,000 extension to the power house of the Des Moines Electric Company will be built this summer. Contracts will be let for the construction work in a short time. The extension will be large enough to house boilers generating several thousand horsepower, and one battery will be installed immediately. The extension will be constructed immediately north of the present power house on Center Street.

MAQUOKETA, IOWA.—The Iowa Electric Company, which has taken over the local electric light plant, is contemplating improvements in its transmission lines running out of Cedar Rapids. Steel poles and towers will be used instead of wooden poles. The new line will be built from Cedar Rapids through Anamosa to this city.

ORIENT, IOWA.—Sealed bids will be received by M. W. Witham July 14 for constructing an eight-mile transmission line and distributing lines in town. Bids for furnishing the material, f. o. b. Orient, will also be received.

MARSHALL, MO.—Bonds in the sum of $75,000 have been voted to establish an electric-lighting plant to be operated in connection with the municipal water system.

GREEN, KANS.—The Highland Light & Power Company has been incorporated with a capital of $40,000 by J. S. Barry, William Steinfeldt and others.

HANOVER, KANS.—The Hanover Light & Power Company has been incorporated by Henry B. Collier, J. A. Hopkins and others to furnish electric service here.

JUNCTION CITY, KANS.—Associated utility companies of Manhattan and Junction City will be put under one name and ownership, if the application of the Commonwealth Utilities Service Company, a Colorado corporation chartered in Kansas, is granted by the Public Utilities Commission. The company has contracts to purchase the Manhattan Ice, Light & Power Company, the Rocky Ford Mill & Pow-

er Company, the Blue River Power Company and the Baler-Pierce Electric Company, the latter three of Junction City.

MINNEOLA, KANS.—The Council is planning ways and means to secure a municipal electric-lighting system.

OLATHE, KANS.—Purchasers of $50,000 of bonds voted recently by Olathe for the purchase or building of an electric light plant rejected the bonds because the election notice read either to purchase or build. Attorney General Brewster of Kansas upheld the opinion of the bond buyers, that one purpose should have been specified. It is probable that the present plant would be purchased. Another election will be held.

RAMONA, KANS.—The Riverside Light, Power & Gas Company with a plant at Abilene, Kans., having been granted a 20-year contract at Ramona, will furnish electric service to this and other cities in the district.

SCOTT CITY, KANS.—The Sugar Beet Company has purchased a large tract of land south of Scott City and will extend its transmission lines to provide power for irrigation.

NEHAWKA, NEB.—The local electric-lighting plant, owned by E. M. Pollard, recently was destroyed by fire.

NORFOLK, NEB.—The Council is considering plans for the extension of the street-lighting system.

HOWARD, S. D.—The city recently closed negotiations for the purchase of the local electric-lighting plant.

WINNER, S. D.—E. L. Snyder has taken over the electric franchise granted to Floyd Hunt. Work on the new plant will commence in a few weeks.

JAMESTOWN, N. D.—S. L. Bartlett, architect, 1012 Germania Life Building, St. Paul, Minn., is preparing plans for a one-story, 75 by 146-foot fireproof power house for this city. The new plant will cost $25,000 and will replace the present plant, which will be abandoned. The electrical equipment has already been purchased.

SOUTH CENTRAL STATES.

EARLINGTON, KY.—The city is considering plans for the installation of an electric-lighting plant to cost $20,000.

LANCASTER, KY.—Construction work on the hydrolectric plant which is to be constructed on the Dix River, near Kennedy's Mill, Garrard County, has been begun under the supervision of Louis B. Herrington, of Richmond, who represents New York interests. The plant is to supply power to numerous central Kentucky cities, and is to cost about $3,000,000. Workmen's cottages are being constructed and 500 men will be employed.

PERRYVILLE, KY.—The plant of the Perryville Lighting & Ice Company recently was destroyed by fire. The loss was $15,000, partly covered by insurance.

STITHTON, KY.—The Stithton Electric Company, operating the local lighting plant, has been incorporated with $3,000 capital by L. J. Metcalfe, C. H. Aubrey and John Fisher.

MEMPHIS, TENN.—The Delta Planting Company, Central Bank Building, will install a wireless telegraph system from Memphis to its seven cotton plantations in Mississippi, a distance of 175 miles.

MEMPHIS, TENN.—Representatves of the Merchants' Power Company and the Consolidated Gas & Electric Company, of this city, have notified the City Commission that its demand for a rate of 5 cents for service for less than 50 kilowatts per month could not be acceded to. This, it is declared, marks the end of negotiations, and it is expected that the City Commission will call on Frederick W. Ballard, of Cleveland, to begin the preliminary survey for erection of the municipal plant, for which the city has a $1,500,000 bond issue.

COLUMBUS, MISS.—The Columbus Railway, Light & Power Company is planning to install a 500-kilowatt generating unit.

GEORGETOWN, MISS.—X. A. Kramer, consulting engineer, of Magnolia, Miss., is preparing plans for municipal electric-lighting and water plants.

GURDON, ARK.—The Gurdon Electric Company has been incorporated by F. L. Stut, R. Swartz and G. P. Whittington. The company will operate an electric-lighting and ice plant.

MARMADUKE, ARK.—The Marvell Electric Light & Power Company has been incorporated with a capital of $15,000 by A. Bertig, S. Bertig and others.

MORRILTON, ARK.—Construction work on the transmission line of the Arkansas Light & Power Company between this city and Plumerville is under way, and the latter city will be supplied with electrical energy for lighting in less than 30 days. For a time the energy will be supplied from the plant in this city, but later a line will be built from here to Russellville, and the line from Plumerville to Russellville will be supplied with electrical energy from the large hydroelectric plant at Russellville.

LAKE CHARLES, LA.—F. H. Frankland has been authorized to negotiate for the installation of a small electric plant to operate the Calcasieu River bridge when it is completed. The plant is estimated to cost $2,600, and will supply energy for lights and for the motors operating the bascule lift.

CORPUS CHRISTI, TEX.—The Ward Island Interurban Railway is receiving construction material for its proposed line to run from Corpus Christi to Ward Island, a distance of 11 miles. Armsby McHarg, of New York, is president. The cars will be of the Edison-Beach storage type.

DALLAS, TEX.—The Mackay Telegraph Company has obtained a permit from the City Commission to lay conduits in the city streets here for long-distance telephone wires.

EL PASO, TEX.—The Stone & Webster Engineering Corporation will place all overhead electric and power wires in the business district in underground conduit at a total cost of about $325,000.

EL PASO, TEX.—The Alto Light & Power Company has sold its light and power plant to the Parsons Gold Mining & Milling Company. The new owners intend to install new machinery and make other improvements.

GALVESTON, TEX.—The installation of an ornamental lighting system in Avondale Avenue is proposed by citizens in that neighborhood.

PALESTINE, TEX.—The Texas Power & Light Company will extend its transmission line from Palestine to the salt works, five miles west of here.

PLAINVIEW, TEX.—The Texas Utilities Company will install a 500-horsepower oil-burning engine in its central electric power station here. It is reported that the power transmission system of the company will also be extended.

SAN ANGELO, TEX.—The local electric light company is extending its power transmission line from San Angelo to Rowena, a distance of about 25 miles.

TERRELL, TEX.—The Texas Power & Light Company, of Dallas, is erecting a substation here preparatory to supplying this city with electrical energy for light and power.

WHARTON, TEX.—Improvements of a substantial nature are being made by the Texas Southern Electric Company at its plant here. A contract has been awarded for the erection of a reinforced concrete addition to the present structure.

DATES AHEAD.

Public Utilities Association of West Virginia. Annual convention, Parkersburg, W. Va., July 12-14. Secretary, W. C. Davisson, Charleston, W. Va.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 18-21. Secretary, D. L. Gaskill, Greenville, O.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 19-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

International Association of Municipal Electricians. Annual convention, Baltimore, Md., August 22-25. Secretary, C. R. George, Houston, Tex.

Association of Edison Illuminating Companies. Annual convention, Hot Springs, Va., September 4-7. Secretary, George C. Holberton, San Francisco, Cal.

Pennsylvania Electric Association. Annual convention, Eagles Mere, Pa., September 5-8. Secretary, H. N. Muller, Duquesne Light Company, Pittsburgh, Pa.

Illuminating Engineering Society. Annual convention, Philadelphia, Pa., September 18-21. Secretary, C. A. Littlefield, Irving Place and Fifteenth Street, New York City.

Association of Iron and Steel Electrical Engineers. Annual convention, Chicago, Ill., September 18-22. Secretary, W. O. Oschmann, Oliver Steel & Foundry Company, Pittsburgh, Pa.

Telephone Pioneers of America. Annual meeting, Atlanta, Ga., October 19-20. Secretary, R. H. Starrett, 15 Dey Street, New York City.

WESTERN STATES.

KALISPELL, MONT.—The Chamber of Commerce has become interested in the proposition of establishing an electric power pumping station to irrigate the Helena Flats and Half Moon districts in the vicinity of Kalispell. J. A. Green, vice-president and general manager of the Montana Power Company, has made preliminary investigations in the proposed improvement district, and states in his opinion an electric irrigation system would be cheaper and would give far better service than a gravity system. The farmers and ranchers in the districts named have expressed considerable interest in the proposition, and undoubtedly the plan will ultimately be carried out.

LENOX, MONT.—The Helena (Mont.) Light & Railway Company is considering an extension of its transmission lines to this city.

POPLAR, MONT.—J. M. Stewart James MacDonald, James Helmer and Linden O. Johnson, all of Poplar, recently filed articles of incorporation for the Citizens' Electric Light & Power Company, of Poplar. The capitalization is given at $40,000.

ROUNDUP, MONT.—The City Council has awarded the contract for the installation of the electric lighting system to the Butte Electric Supply Company, of Butte, and the contract for installing the lights to E. T. Barron, of Butte. Work of installing the system will begin at once.

DUNCAN, ARIZ.—The Carlisle Mining Company has announced plans for the erection of a modern power plant at Duncan, and the construction of an electric railway between this city and the mines at Steeplerock, N. M.

SALT LAKE CITY, UTAH.—Work is progressing rapidly on the transmission line which the Utah Power & Light Company is installing between Springville and the Mohrland and Blackhawk mines in Carbon County. The line will be about 100 miles in length, and will represent an expenditure of about $500,000.

BURLEY, IDAHO.—The Council has under contemplation the issuance of $40,000 in bonds, the proceeds to be used in improving the municipal water plant and in extending the electric-lighting system.

JOHNSON, IDAHO.—A transmission line to supply farmers along the line between Colton and Johnson is being constructed by the Washington Water Power Company, of Spokane, Wash. The town of Johnson will be furnished with a special low voltage, reduced from 22,000 to 6,900. A substation is being built by the power company at Colton.

EVERETT, WASH.—City Clerk Louis Lesh has filed nine applications for water in the Sultan River, the water to be diverted from the nine separate points to be used for the development of electrical energy to be transmitted to Everett and for other purposes.

SPOKANE, WASH.—The city clerk will shortly call for bids for the installation of an ornamental lighting system on Main Street from Division to Monroe Streets. Plans for the improvement are being prepared by Morton MacCartney, city engineer.

ASTRIA, ORE.—New bids for the installation of power and lighting service wiring in the municipal grain elevator under construction will shortly be received by the Port of Astoria.

OREGON CITY, ORE.—The proposition of constructing a municipal light and power plant, fathered by Mayor E. C. Hackett, is gaining considerable momentum. According to reports, a majority of the council favor making the improvement, and it is asserted the proposition of issuing bonds to purchase machinery and make the installations will be placed before the registered voters at an election to be held this fall. The city reserved water power sufficient to develop 5,000 horsepower when the site owned by the city was turned over to the Hawley Pulp & Paper Company, of Oregon City, and if the proposition of constructing a municipal plant carries at the election the reservaton will be utilized.

PORTLAND, ORE.—F. A. Bauman, Portland, submitted the lowest bid to the City Council for the installation of electric wiring in the proposed auditorium, his bid being $27,895. Other bidders were: Miller

& Halls, $34,590; West Coast Engineering Company, $35,702; Morrison Electric Company, $6,350; Ne Page-McKenna, $34,985. All bidders were Portland concerns. The contract has not been awarded to date, but it is reported the same will be let to the lowest bidder.

COLLEGE CITY, CAL.—The State Railroad Commission has authorized the extension of the power line of the Northern California Power Company, from College City to Dunnigan, and the furnishing of electric energy to all that portion of Yuba County not now served by the Pacific Gas & Electric Company, and the exercise within such territory of the rights under a franchise for which the corporation has applied to Yolo County.

FORT BRAGG, CAL.—The Western Union Telegraph Company contemplates improvements to its system in this district.

FRESNO, CAL.—The county surveyor has been instructed to prepare plans for the proposed improvement of the lighting system in the court house park.

HAYWARD, CAL.—A committee has been appointed by the Chamber of Commerce to confer with the City Trustees regarding the installation of an electrolier lighting system on the principal business streets.

LOS ANGELES, CAL.—The Board of Supervisors has adopted specifications for changes in the lighting system of the court house and hall of records, and will receive bids for the work up to July 24.

MERCED, CAL.—Bids are being taken for the installation of street-lighting systems in the towns of Atwater, Le Grand and Dos Palos.

MERCED, CAL.—The City Trustees have appointed a committee to canvass property owners regarding the proposed installation of an electrolier system in the business district.

OAKLAND, CAL.—The courts will probably be asked to settle the question as to whether the power wires of the Great Western Power Company shall be installed above or below ground in the Fourth Avenue Heights district. Representatives of the Glen View and Montclair Improvement Clubs have appealed to the City Council to have the wires placed underground, but the attorneys for the corporation declare that the cost of the work would be excessive.

RIVERSIDE, CAL.—The California Southern Railroad Company has applied for a telephone and telegraph franchise along certain public highways in Riverside County. The Board will receive bids for said franchise up to July 26.

SAN LEANDRO, CAL.—Adoption of a new street-lighting system, consisting of electroliers and overhead lights of 250 candlepower will be recommended by the Town Board, the system having been considered and approved at a recent executive meeting of the city officials.

SANTA ROSA, CAL.—At a recent election the formation of the Wilson lighting district was authorized.

HILO, HAWAII.—Negotiations are under way here for the transfer of the controlling interest in the Hilo Electric Light Company from the Irwin estate, Spreckels' interests, Ohlandt & Buck and John A. Scott to citizens of Hilo. It is proposed that local interests buy out the stock of the company, now held largely by outside shareholders, through the First Bank of Hilo.

Proposals

ELECTRIC-LIGHTING PLANT.—Sealed proposals will be opened in the office of the Supervising Architect, Treasury Department, Washington, D. C., at 3 p. m. July 19, for an electric-lighting plant at the United States quarantine station at Galveston, Tex. See proposal columns for details.

FIRE-ALARM BOXES.—Sealed proposals will be received by the Commissioner of Gas and Electricity, Room 614 City Hall, Chicago, Ill., until July 11, for furnishing and delivering to the Department of Gas and Electricity approximately 80 fire-alarm signal boxes, complete, strictly in accordance with specifications on file in the office of said official. William G. Keith, Commissioner of Gas and Electricity.

ELECTRIC-LIGHTING PLANT.—Sealed bids will be received July 10, by K. P. B. Bonner, Morehead City, N. C., for furnishing all machinery and material for electric light plant improvements. The approximate quantities are as follows: one 150-horsepower boiler; stack and steel casing; one 180 to 210-kilovolt ampere generator, direct connected to Unaflow engine; one 90-kilovolt-ampere belted generator; one 25-kilovolt-ampere regulator for street lighting; one switchboard, and other material.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: **Schedule** 9815, Norfolk, Va., one exhaust fan, complete. Schedule 9817, Key West, Fla., nine watt-hour meters. Schedule 9829, Brooklyn, N. Y., one 5-kilowatt radio transmitting set. Schedule 9832, Brooklyn, N. Y., 12,000 feet of lighting and power wire, 30,000 telephone wire and 3,200 pounds of weatherproof wire. Schedule 9839, Philadelphia, Pa., seven W. T. annunciators and miscellaneous fiber rods; Boston, Mass., 2,000 transmitting condensers (jars); Brooklyn, N. Y., 11,700 feet of interior communication cable, miscellaneous material for switchboard panels, miscellaneous single-conductor cable, and 1,500 rolls of tape for electrical purposes. Schedule 9850, Brooklyn, N. Y., one 1-horsepower, electrically driven blower, and one 6-horsepower, 22-volt motor. Schedule 9851, Portsmouth, N. H., Brooklyn, N. Y., and Puget Sound, Wash., three 110-volt electric ranges. Schedule 9858, various navy yards, 27,800 flashlight batteries, 7 by 1¾ inches, 8,000 flashlights without batteries. Bidders desiring to submit proposals should make application immediately for schedules to the Bureau, or to the Purchasing Office nearest to navy yard where delivery is to be made.

New Publications

CANADIAN MINERALS.—The Canadian Department of Mines has published its annual report for the year 1914 on "The Mineral Production of Canada," by John McLeish. The report covers both metallic and non-metallic products and gives figures for imports and exports as well as for domestic production.

AUSTIN REPORT.—The annual report of the Water, Light and Power Department of the City of Austin, Texas, for the year 1915 has been issued by E. C. Bartholomew, superintendent. This not only gives financial and operating data of the department, but relates the troubles which have been experienced in attempting to complete the Austin dam.

COLOR PHOTOMETRY. — Scientific Paper No. 277 of the Bureau of Standards, Washington, D. C., is entitled "An Interlaboratory Photometric Comparison of Glass Screens and of Tungsten Lamps Involving Color Differences," by G. W. Middlekauff and J. F. Skogland. Differences which were slight, but not negligible, were found in the measurements at different laboratories.

MARKETS FOR MACHINERY IN ARGENTINA.—The Bureau of Foreign and Domestic Commerce has issued a bulletin with the foregoing title which is No. 116 of its Special Agents Series. It is a 63-page report by Special Agent J. A. Massel, a mechanical engineer well versed in the commercial end of the machinery and machine-tool business and who is well acquainted with the Latin-American countries. The bulletin gives a review of the conditions in this field in Argentina and shows that by far the greater part of the machinery used in Argentina has come from England and Germany. The opportunity of American manufacturers to increase their trade in this line is pointed out. Copies of this bulletin can be obtained from the Superintendent of Documents, Washington, D. C., for 20 cents each.

Financial Notes

A trust deed for $3,500,000, of which $1,000,000 only is now effective, has been filed to secure the new bond issue of the Santa Barbara (Cal.) Gas & Electric Company. The outstanding bonds will be retired and the balance of the $1,000,000 will be used for extensions.

The City Council of **Seattle, Wash., is** considering a bill which will retire $50,000 of the light and power bond issue of $400,000 which is held by the state and which bears interest at 3.75 per cent. Each year the lighting department sets aside $50,000 in the light bond sinking fund, and to date $100,000 of the $400,000 issue has been retired.

The Spokane & Eastern Trust Company, of Spokane, Wash., recently purchased $61,000 in bonds of an issue of $144,000 floated by the Lewis County (Idaho) Electric Company, backed by the guarantee of the Grangeville Electric Light & Power Company, which owns and operates electric light and power stations in about ten towns in Idaho. The bonds bear six-per-cent interest, are payable semi-annually and mature on December 1, 1936.

Stockholders of Northern States Power Company are offered option warrants to convert holdings of $8,000,000 ten-year six-per-cent notes into preferred or common stock or to purchase at equivalent price one share of either issue for each option warrant held. All stockholders of record July 6 may acquire option warrants at $3 each to extent of one warrant for each two shares of stock, subscriptions to be made before July 31. Options may be exercised between April 1, 1918, and April 1, 1922.

A new corporation organized to take over the property and business of the Chicago & Milwaukee Electric Railroad Company, which has been in the hands of the United States court and purchased recently at mortgage sale by Frank A. Vath, of Chicago, and Charles White, of Glencoe, Ill., has filed articles of incorporation. The name of the new corporation is North Shore, Racine & Milwaukee Railroad. The incorporators are Frank A. Vath, Charles White, and C. L. Burlingame of Evanston, Ill., Anthony White, of Chicago, and Harry Goodman, of Chicago. The capital stock of the company is $100,000. The railroad line involved extends through Kenosha, Racine and Milwaukee counties and is 40 miles in length. The capital consists of 1,000 shares of $100 each, all to be common stock. In the schedule of stock ownership filed 996 shares are owned by Charles White and one share each is owned by the other incorporators.

At the special meeting of Cities Service Company, held at Dover, Del., stockholders approved an increase in the authorized capitalization of the company to $60,000,000 six-per-cent preferred stock, and $40,000,000 common, this being an increase of $20,000,000 in preferred and $15,000,000 in common stock from present authorized amounts. At present, Cities Service Company has outstanding $34,530,217 preferred and $18,058,826 common stock. Of the unissued preferred and common stocks a part will be issued soon to provide for the acquisition of the common and preferred stocks of Toledo Traction, Light & Power Company, the preferred stock of Electric Bond Deposit Company, and the capital stocks of Lincoln Gas & Electric Company, and Montgomery Light & Water Power Company, under terms announced some time ago; and the remainder will be held for future corporate purposes of the company, and for the payment of the dividends in common stock on Cities Service common, as announced in the dividend plan made public at the meeting of the directors of Cities Service in May.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	July 3	June 26
American Tel. & Tel. (New York) (ex-dividend)	128⅛	130⅜
Commonwealth Edison (Chicago)	143	143½
Edison Electric Illuminating (Boston)	238	238
Electric Storage Battery, common (Philadelphia)	62¼	62
Electric Storage Battery, preferred (Philadelphia)	62¼	62
General Electric (New York)	167	166
Kings County Electric (New York)	130	130
Massachusetts Electric, common (Boston)	6	6
Massachusetts Electric, preferred (Boston)	34	34
National Carbon, common (Chicago)	170	170
National Carbon, preferred (Chicago)	123	123
New England Telephone (Boston)	134½	134½
Philadelphia Electric (Philadelphia)	28⅝	28⅞
Postal Telegraph and Cables, common (New York)	68	67
Postal Telegraph and Cables, preferred (New York)	81	82
Western Union (New York)	93¾	92¾
Westinghouse, common (New York)	57¾	58¼
Westinghouse, preferred (New York)	67	70

The New York Public Service Commission has authorized the absorption of the Elmira Transmission Company and of the Elmira & Seneca Lake Traction Company by the Elmira Water, Light & Railroad Company. All the capital stock of the transmission company is authorized to be bought and it is to be merged with the larger concern, which will purchase all the assets and assume the liabilities of the Elmira & Seneca Lake Traction Company. The Elmira Water, Light & Railroad Company is authorized to issue $100,000 of its five-per-cent first consolidated mortgage bonds at not less than 92.5, $125,000 of its seven-per-cent cumulative preferred and $200,000 of its five-per-cent second preferred stock both at par, netting in all $417,500. The proceeds will be used toward paying $402,114 of bills and accounts payable of October 31, 1915, against the Water, Light & Railroad Company, $55,000 bills payable of the transmission company, $16,250 expenses incident to these transactions and $63,570 for new construction from October 31, 1915. The commission approves the inventory and appraisal of the Elmira Water, Light & Railroad Company's property as of June 30, 1914, as affected by its subsequent operations and provides for the amortization of one and a half millions of the company's two and a half million "intangible suspense to be amortized" account at the rate of $20,000 a year for five years and then at the rate of $30,000 a year. The order contains many other detailed provisions for bringing the books of the company into accord with the uniform system of accounting prescribed by the commission and for safeguarding the company's capital account against undue charges. It requires a full report to the commission of all of the transactions concerned with the merger of the transmission company and the acquisition of the property and franchises of the traction company.

Dividends.

	Term	Rate	Payable
Bay State St. Ry., first pf.	S	$3.00	Aug. 1
Bell Tel. of Penna.	Q	1.5 %	July 15
Bos. Suburban Elec., pf.	Q	50c	July 15
Cin., Newport & Cov. Lt. & Trac., com.	Q	1.5 %	July 15
Cin., Newport & Cov. Lt. & Trac., pf.	Q	1.125%	July 15
Consumers Elec. Lt. & Pw., New Orleans, pf.	Q	1.75 %	June 30
Detroit United Rys.	Q	1.75 %	Sept. 1
Edison Co. of Boston	Q	$3.00	Aug. 1
Elec'l Util. Corp., pf.	Q	1.25 %	July 15
Elmira Water, Lt. & R. R., first pf.	Q	1.75 %	June 30
Elmira Water, Lt. & R. R., second pf.	Q	1.25 %	June 30
Ill. Northern Util., pf.	Q	1.5 %	Aug. 1
Pacific Tel. & Tel., pf.	Q	1.5 %	July 15
Pub. Service of Northern Ill., com.	Q	1.5 %	Aug. 1
Pub. Service of Northern Ill., pf.	Q	1.5 %	Aug. 1
United Gas & Elec., pf.	S	2.5 %	July 15
United Gas & Elec. Corp., first pf.	Q	1.75 %	July 1
Western States Gas & Elec., pf.	Q	1.75 %	July 15

Reports of Earnings.

TENNESSEE RAILWAY, LIGHT & POWER.

Tennessee Railway, Light & Power Company reports the following combined earnings of subsidiaries, with all inter-company accounts eliminated for the four months ended April 30, 1916:

	1916	1915
Gross earnings	$1,485,792	$1,220,753
Net after taxes and rentals	722,637	517,062
Surplus after interest and dividends on stocks not owned	244,207	48,452

Tennessee Power Company, the principal generating subsidiary, for April, reported gross of $109,785, an increase of 38.8 per cent over April, 1915, with net of $59,393, a gain of 74.8 per cent and a surplus after charges of $22,749 compared with a deficit of $4,202 for April, 1915.

COLUMBIA GAS & ELECTRIC.

	1916	1915	Changes
May gross	$658,907	$557,016	Inc. $101,891
Net after taxes	315,149	247,089	Inc. 68,060
Total income	359,697	283,059	Inc. 76,638
Surplus after charges	20,334	*54,368	Inc. 74,702
Five months' gross	4,136,448	3,798,874	Inc. 337,574
Net after taxes	2,201,646	1,984,864	Inc. 216,782
Total income	2,399,628	2,176,405	Inc. 223,223
Surplus after charges	710,585	489,471	Inc. 221,114

*Deficit.

AMERICAN POWER & LIGHT.

Combined earnings of subsidiaries:

	1916	1915	Changes
May gross	$634,705	$582,933	Inc. $51,772
Net after taxes	281,961	250,586	Inc. 31,375
12 months' gross	8,041,049	7,641,337	Inc. 399,712
Net after taxes	3,711,713	3,480,199	Inc. 231,514

NEW ENGLAND POWER COMPANY.

	1916	1915
May gross	$173,356	$118,226
Net after taxes	118,991	81,048
Surplus after charges	66,847	36,382
Balance after accrued dividends	39,694	9,337
12 months' gross	1,732,266	.....
Net after taxes	1,132,897	.....
Surplus after charges	561,921	.....
Balance after accrued dividends	237,358	.....

CONSOLIDATED GAS, ELECTRIC LIGHT & POWER.

Consolidated Gas, Electric Light & Power Company, of Baltimore, reported earnings for May, 1916, as follows:

	1916	1915
Gross earnings	$ 612,111	$ 538,880
Net after taxes	276,824	229,274
Total income	276,797	232,598
Surplus after charges	153,546	93,917
Balance after dividends	51,705	6,476

BYLLESBY COMPANIES.

Combined earnings of all public utility properties under management of H. M. Byllesby & Company for May, 1916, and the 12 months ended May 31 show:

	1916	1915
May gross	$1,302,873	$1,105,290
Net after taxes	607,518	543,142
12 months' gross	16,176,797	14,945,810
Net after taxes	7,950,881	7,157,653

INTERBOROUGH RAPID TRANSIT.

	1916	1915
May gross	$3,231,008	$2,904,773
Net after taxes	1,805,901	1,624,659
Total income	1,866,868	1,698,324
Surplus after charges	873,562	786,463
Queensboro subway	12,626	.....
Total surplus	886,187	786,463
Passengers carried	61,798,491	56,307,020
Eleven months' gross	32,933,752	30,744,300
Net after taxes	17,955,332	16,907,837
Total income	18,483,791	17,474,517
Surplus after charges	8,067,913	7,470,966
Queensboro subway	163,678	.....
Total surplus	8,231,591	7,470,966
Passengers carried	627,294,178	595,417,855

UNITED GAS & ELECTRIC.

Consolidated earnings of subsidiaries of United Gas & Electric Corporation for May and the 12 months ended May 31 show:

	1916	1915
May gross	$1,194,347	$1,062,245
Net after taxes	490,898	429,333
Fixed charged	289,261	280,168
Surplus	201,637	149.165
12 months' gross	14,231,823	13,186,559
Net after taxes	6,321,746	5,532,358
Fixed charges	3,449,360	3,338,087
Surplus	2,872,386	2,194,271

Income of United Gas & Electric Corporation from all sources, after deduction of expenses for year ended May 31, 1916, was $1,461,728 from which was charged $483,926 interest on bonds, $43,695 amortization of debt discount, and $649,936 for dividends on first-preferred stock, leaving a surplus of $284,171.

PACIFIC LIGHT & POWER CORPORATION.

	1916	1915
April gross	$ 255,828	$231,339
Net after taxes	172,043	152,503
Total income	180,195	163,414
Surplus after charges	74,404	55,602
Four months' gross	1,017,244	909,761
Net after taxes	659,756	591,983
Total income	695,741	636,625
Surplus after charges	271,156	204,536

FEDERAL LIGHT & TRACTION.

Federal Light & Traction Company and subsidaries reported combined earnings for February, 1916, excluding depreciation charges, with all inter-company accounts eliminated:

	1916	1915
Gross earnings	$216,157	$201,501
Net after taxes	72,442	71,301
Interest charges	48,636	50,808
Surplus	23,806	20,493

DENVER TRAMWAY SYSTEM.

The Denver Tramway System has issued its report for the year ended March 31, 1916. Consolidated income account compares as follows:

	1916	1915
Gross earnings	$3,174,666	$3,263,954
Operating expenses	1,626,193	1,683,960
Balance	1,548,472	1,579,994
Taxes and franchise payments	280,769	279,220
Net earnings	1,267,704	1,300,775
Other income	20,608	32,295
Total income	1,288,312	1,333,070
Interest on funded debt, notes, etc.	990,554	1,010,765
Net income	297,757	322,305
Profit and loss credits	2,610	1,091
Profit and loss charges	30,041	13,116
Surplus	270,327	310,281
Previous surplus	205,331	136,912
Total surplus	475,658	447,193
Dividends	30,395	241,862
Profit and loss surplus	445,262	205,331

New Incorporations

SWANTON, O.—Swanton Light & Power Company has increased its capital stock from $10,000 to $20,000.

RICHMOND, VA.—National Power Company. Capital, $25,000. Incorporators: S. B. Nichols and S. Potter, of Hopewell, Va.

SOUTH BEND, IND.—Quick Action Ignition Company. Capital, $450,000. Manufacture electrical machinery. Incorporators: O. R. Beyler, G. T. Dunklin and E. E. Hawkinson.

NEW YORK, N. Y.—Carl Anderson Electric Corporation. Capital, $200,000. Manufacture telephone devices, etc. Incorporators: T. F. McMahon, B. C. Elliott and S. M. Kelleher, all of 1400 Broadway.

DALLAS, TEX.—Lawrence Electric Company has increased its capital stock from $10,000 to $25,000, and changed its place of business from Galveston to Dallas, with branch offices in Galveston and El Paso.

NEW YORK, N. Y.—H. & H. Ignition Corporation. Capital, $1,000. Manufacture electrical ignition apparatus for automobiles, etc. Incorporators: R. H. Hixon, Peekskill, and F. W. Palmer and H. K. Harrison, of 66 Broadway.

DOVER, DEL.—Choctaw Power & Light Company. Capital, $1,500,000. To engage in the production of electricity for light, heat and power. Incorporators: H. E. Latter and H. T. Farrow, of Wilmington, and C. M. Egner, of Elkton, Md.

Electrical Patents Issued June 20, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,187,500. Signaling Device. M. Cerf, Jr., Louisville, Ky. Direction-indicating system for automobiles.

1,187,534. Electric Cutout Box. L. Kossoy, New York, N. Y. Embodies lid-retaining features.

1,187,543. Electric Welding Machine. T. E. Murray and H. R. Woodrow, New York, N. Y. Apparatus for welding together half sections of sheet-metal wheel hubs.

1,187,500. Tester for Electric Wiring Systems. G. B. Raymond, Danbury, Conn. Telephone head set for testing for opens or grounds.

1,187,555. Portable Electric Flashlight. C. J. Sagebrecht, Brooklyn, N. Y. Construction details of insulating casing and switch.

1,187,565. Electric Switch for Portable Electric Lights. B. Tauber, New York, N. Y. Slide construction.

1,187,574. Portable Electric Light. C. Wachtel, Brooklyn, N. Y. Lamp with leather casing.

1,187,586. Electric Railway Signal and Appertaining Mechanism. D. C. White, Tyrone, Pa. System for block signalling.

1,187,625. Timing or Controlling Mechanism. R. S. Jacobsen, Chicago, Ill. Control effected by means of fluid-operated apparatus.

1,187,630. Electric Furnace. M. M. Kohn, New York, N. Y. Heat can be varied or maintained constant.

1,187,633. Method for Production of Cyanogen Compounds. A. R. Linblad, Ludvika, Sweden. Charge electrically heated and fed on a slope.

1,187,634. Automatic Exchange. G. W. Lorimer, administrator of J. H. Lorimer, deceased, Brantford, Ont., Canada. System amplified by group arrangement of substations.

1,187,645. Float-Controlled Circuit Breaker. A. Mosegard, Morgan Hill, Cal. Details.

1,187,657. Attachment Plug. H. R. Sargent, Schenectady, N. Y. Detachable construction.

1,187,670. Jump-Spark Tester. P. B. Spofford, Haverhill, Mass. For application to spark plug; has compact arms.

No. 1,187,723.—Adapter for Electric Sockets.

1,187,671. Automatic Telephone System. A. E. Stevens, Quincy, Mass. Designed for application in a private installation.

1,187,672. Illuminating Eye Shield. J. Stiefvater, Utica, N. Y. Miniature lamp supported by eye shield.

1,187,723. Adapter for Electric Sockets. J. H. George, Bridgeport, Conn. For adapting lamps of two-wire systems to a one-wire system and vice versa. (See cut.)

1,187,757. Electric Heater. C. P. Madsen, Chicago, Ill. Construction permits use in a number of different applications.

1,187,767. Electric Alarm. W. C. Neahr, Denver, Col. Circuit-controlling apparatus.

1,187,768. Electric Relay. W. C. Neahr, Denver, Col. For maintaining a device in operation during a predetermined period.

1,187,782. Trolley Pole Device with Automatic Release and Folding. C. E. and P. Pigache, Paris, France. Pole base has collapsible construction.

1,187,784. Electrically Operated Typewriter. P. C. Rawls, Des Moines, Iowa. Operation unaffected by touch.

1,187,795. Apparatus for Converting Heat Energy. C. Trettin, Berlin, Germany. For utilizing steam energy efficiently.

1,187,805. Indicating Device for Vessels. J. H. Benson, Key West, Fla. Device is controlled by engine reversing lever.

1,187,806. Automatic or Semi-Automatic Telephone System. G. A. Betulander, Sodertorns Villastad, Sweden; N. G. Palmgren, London, England, and O. Grahn, Stockholm, Sweden. Impulse relay and controlling magnet operated by variations of current in loop circuit.

1,187,823. Alarm for Incubators. O. Erikson, Indiahoma, Okla. Small, compact, and readily adjusted.

1,187,839. Carbon Holder for Electric Headlights. A. Hunsicker, El Reno, Okla. Complete consumption of each carbon insured.

1,187,872. Safety Appliance for Electric Railways. J. C. Thompson, Lemoyne, Pa. Switch for derailing.

1,187,891. Direction Indicator. W. Elmenthaler, Cleveland, Ohio. For vehicles; has two independent sets of signals.

1,187,894. Combined Choke Coil and Fuse. J. L. Fay, St. Louis, Mo. Particularly for protection of transformers in distribution circuits. (See cut.)

1,187,897. Electromagnetic Switch. A. K. H. Friedmann, Chicago, Ill. Remote-control, line closing and opening switch.

1,187,903. Electrolytic Apparatus. W. E. Greenawalt, Denver, Col. Electrolyte agitated and disintegration of electrodes retarded.

1,187,911. Electric Switch. B. D. Horton, Detroit, Mich., and W. P. Hammond, Passaic, N. J. Switch is open when cover is opened.

1,187,924. Electric Water Heater. C. O. Pearson, Brooklyn, N. Y. Controlled by a single valve.

1,187,928. Test Circuits. F. N. Reeves, Newark, N. J. Circuits for selector switch.

1,187,947. Call-Distributing System for Telephone Exchanges. A. H. Weiss, Wilmette, Ill. Has operator controlled means to make cord circuit of any group receiving first incoming call.

1,187,982. Fire Alarm. C. B. Eastman and M. C. Eastman, Georgetown, Mass. To give alarm of fire in any part of building.

1,187,985. Telegraph Transmission System. J. Gell, London, England. Means for bringing instruments into operation in proper sequence.

1,188,002. Telephone System. H. J. Meredith, Holyoke, Mass. Employs use of alternating current for transmitting over long distance.

1,188,024. Electrical Attachment Plug. C. E. Treat, Santa Ana, Cal. Spaced resilient jaws to receive different makes of plugs.

1,188,045. Electric Regulation. J. L. Creveling, New York, N. Y. For battery charging.

1,188,053. Telephone Apparatus. H. C. Egerton, Passaic, N. J. Microphone construction.

1,188,054. Connector for Electric Conductors. E. H. Faile, New York, N. Y. For securing stranded conductors. (See cut.)

1,188,055. Connector for Electric Conductors. E. H. Faile, New York, N. Y. Adapted to receive solder. (See cut.)

1,188,056. Connector for Electric Conductors. E. H. Faile, New York, N. Y. Combination of wedge and solder for connector. (See cut.)

1,188,057. Process of Making Metallic Filaments. K. Farkas, Glen Ridge, N. J. Flexible to permit shaping.

1,188,060. Freight-Routing Apparatus. R. F. Fitzhenry and J. G. Ebner, Chicago, Ill. For overcoming misplacing of freight cars.

1,188,121. Illuminating Device. E. Weintraub, Lynn, Mass. High-pressure mercury-arc lamp.

1,188,145. Phase Transformation. L. F. Blume, Pittsfield, Mass. Two phase to three phase or vice versa.

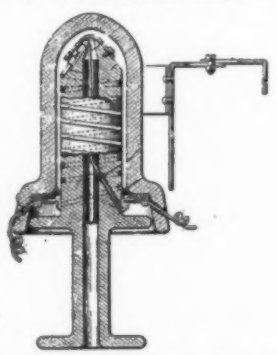
1,188,148. Heat Treatment of Rails. F. D. Carney and J. C. Reed, Steelton, Pa. Process for hardening and toughening.

1,188,157. Vibrating Rectifier. John T. Dempster, Schenectady, N. Y. Flux in transformer vitalized to avoid necessity of extra circuit.

1,188,169. Starting and Controlling Mechanism. R. D. Given, Crick, England. For liquid rheostat.

1,188,182. Induction Motor. F. H. Kierstead, Pittsfield, Mass. Squirrel-cage wiring with eddy current loss.

1,188,186. Incandescent Lamp. I. Langmuir, Schenectady, N. Y. Helical filament in inner gas.



No. 1,187,894.—Combined Choke Coil and Fuse.

1,188,194. Gaseous Conductor Lamp. D. McF. Moore, E. Orange, N. J. Neon used as a gaseous conductor.

1,188,196. Incandescent Lamp. H. H. Needham, East Orange, N. J. Tungsten lamp containing a constant fluorid.

1,188,202. Hoisting Equipment. C. L. Perry and M. A. Whiting, Schenectady, N. Y. For controlling operation of two electric hoists.

1,188,220. Electrical Device. E. Tamura, Sacramento, Cal. Bracket construction with branch outlet.

1,188,228. Apparatus for Electroplating. F. S. Woodward, Richmond Hill, N. Y. Insures deposit on inner walls of deep pockets.

1,188,256. Trolley Pole. M. Dzwonka, Medina, N. Y. Spring mechanism and hold-down hooks.

1,188,272. Block-Signal System. L. A. Hawkins, Schenectady, N. Y. Rails are conductively continuous for all currents.

1,188,273. Block-Signal System. L. A. Hawkins, Schenectady, N. Y. Two-coil relays utilized.

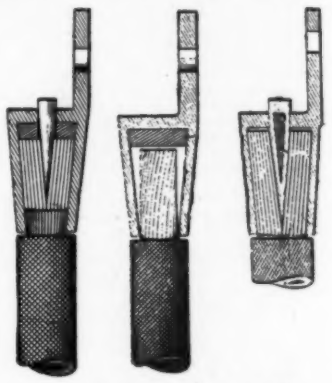
1,188,295. Contact-Breaker Device for Electromagnetic Vibrating Members. A. H. Maitre and V. H. G. Martin, Rouen, France. Oscillation of movable contact piece braked or damped.

1,188,311. Electrically Illuminated Fountain Pen. H. Pendleton, Kokomo, Ind. Miniature lamp placed above pen point.

1,188,324. Electric Spark-Gap Apparatus. J. M. Roberts, Norfolk, Va. Mingles flow of air with spark to get cooling effect.

1,188,350. Synchronizing Device. W. B. Jackson, Chicago, Ill. Mechanical-contact mechanism.

1,188,359. Changeable Controller for Electric Signs. S. Held, Chicago, Ill. Different effects obtained without disconnecting or rearrangng the wires.



Nos. 1,188,054, 1,188,055 and 1,188,056.—Connectors for Electrical Conductors.

Reissue 14,152. Electric Car Lighting System. H. Grob, Furstenwalde, Germany. Pressure regulating system with additional devices.

PATENTS EXPIRED.

The following United States electrical patents expired on July 4, 1916:

627,997. Automatic Magnetic Circuit-Breaker. P. R. Goldey, Philadelphia, Pa.

628,014. Attachment for Electric Motors. C. R. Meston, St. Louis, Mo.

628,026. Method of Controlling High-Tension Currents. H. G. O'Neill, New York, N. Y.

628,046. Repeating and Transmitting Telephone. G. K. Thompson, Malden, Mass.

628,050. Armature for Dynamoelectric Machines. H. H. Wait, Chicago, Ill.

628,068. Telephone System. W. W. Bennett, Mesquite, Tex.

628,078. Magnetic Separator. A. Dings, Milwaukee, Wis.

628,109. Alternating-Current Arc-Lamp. G. L. Moyer, Hartford, Conn.

628,113. Apparatus for Indicating the Number of Conversations Through Telephones. C. Petersen, Copenhagen, Denmark.

628,116. Galvanic Battery. J. von der Poppenburg, Charlottenburg, Germany.

628,177. Safety Appliance for Electric Railways. M. Hoopes, Lynn, Mass.

628,190. Electrical Slow-Starting Device for Machinery. I. Stone, Chicago, Ill.

628,240. Electric Meter. T. Duncan, Fort Wayne, Ind.

628,245. Dynamoelectric Machine. M. Hutin and M. Leblanc, Paris, France.

628,246. Telephony. M. Hutin and M. Leblanc, Paris, France.

628,247. Multiple Telephony and Telegraphy. M. Hutin and M. Leblanc, Paris, France.

628,325. Electric-Clock System. F. Hope-Jones and G. B. Bowell, London, England.

628,343. Fixing of Insulators for Carrying Electric-Line Wires. W. Menzel, Dusseldorf, Germany.

628,351. Electrotherapeutic Apparatus. H. G. O'Neill, New York, N. Y.

628,352. Vacuum Electrode for Therapeutic Purposes. H. G. O'Neill, New York, N. Y.

628,358. Method of and Apparatus for Varying the Number of Phases of Polyphase Currents. H. A. Rowland, Baltimore, Md.

628,373. Electric Furnace. F. P. Van Denbergh, Buffalo, N. Y.

628,393. Electric-Railway Gate. T. O. Cooper, Wilmington, Del.

628,429. Method of Heating Metals by Electricity. E. M. Bentley, Boston, Mass.